

PELICAN ISLAND NATIONAL WILDLIFE REFUGE

Pelican Island Wilderness

A Report on Wilderness Character Monitoring

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U.S. FISH AND WILDLIFE SERVICE

"I found (brown pelicans) breeding in larger and larger numbers as I went north (from Key West), until I arrived at Indian River, where I found the most extensive breeding place I visited; this was a small island called Pelican Island..."

~ Dr. Henry Bryant, Ornithologist ~

1858



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INTRODUCTION

This document was created as part of the U.S. Fish and Wildlife Service National Wildlife Refuge System Wilderness Character Monitoring Program. The goal of this program is to assist refuges in developing a wilderness stewardship and monitoring plan to preserve the wilderness resource at each refuge and is part of a national strategy for wilderness inventory and monitoring. The purpose of this report is to establish a baseline and monitoring strategy for the Wilderness area of Pelican Island National Wildlife Refuge as a part of an interagency initiative to monitor trends in wilderness character throughout the National Wilderness Preservation System. Accompanying this document is a Wilderness Character Monitoring Database with entries for all measures and baseline data specific to this refuge.

The Wilderness Act (see Appendix D) was signed into law on September 3, 1964 by President Johnson. The Act was Congress's response to the evidence that the wild spaces of the United States, which once seemed endless, were in jeopardy due to industrialization which led to deforestation and development of these wild landscapes. The purpose of the Wilderness Act was "to establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes." The Act further states that "... each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character." The Wilderness Act describes wilderness as having the following five qualities.

Untrammeled

Wilderness is "...an area where the earth and its community of life are untrammeled by man..." and "...generally appears to have been affected primarily by the forces of nature"

—Wilderness Act of 1964

Wilderness is essentially unhindered and free from the actions of modern human control or manipulation.

Natural

Wilderness "...is protected and managed so as to preserve its natural conditions"

— Wilderness Act of 1964

Wilderness ecological systems are substantially free from the effects of modern civilization.

Undeveloped

Wilderness is "...an area of undeveloped Federal land...without permanent improvements or human habitation" and "...where man himself is a visitor who does not remain"

— Wilderness Act of 1964

Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.

Solitude or Primitive and Unconfined Recreation

Wilderness "...has outstanding opportunities for solitude or a primitive and unconfined type of recreation"

— Wilderness Act of 1964

Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.

Other Features

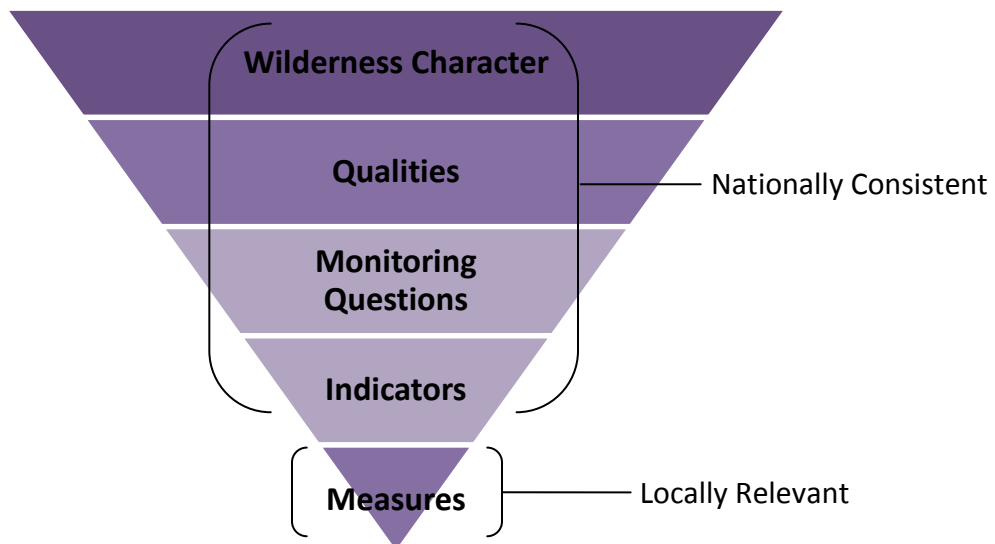
Wilderness “...may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”

– Wilderness Act of 1964

Wilderness preserves other tangible features that are of scientific, educational, scenic, or historical value.

From this descriptive language in the Wilderness Act of 1964, in 2008 an Interagency Wilderness Character Monitoring Team – representing the Department of the Interior Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, U.S. Geological Survey and the U.S. Forest Service – developed a monitoring framework that incorporates monitoring and preservation of these wilderness qualities and published it as *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System*. The framework described in this publication divides the five qualities – which are the foundation of this monitoring – into a hierarchical set of monitoring questions, indicators, and measures to allow the measurement of trends in wilderness character. While the qualities, monitoring questions and indicators are nationally consistent, measures are specific to individual Wilderness areas. This approach balances national and local needs for monitoring by defining locally relevant measures whose trends can be compiled at higher levels for regional or national reporting.

The Wilderness Act calls for wilderness managers to monitor and assess wilderness character. To do this, baseline conditions must be documented as a reference point for which change over time can be measured and evaluated. The monitoring strategy and measures described in this report follows the national strategy described in *Keeping It Wild* and includes an evaluation of current conditions and a plan for monitoring long-term trends in wilderness. Accompanying this report is a Wilderness Character Monitoring Database with entries specific to the Pelican Island Wilderness.



Wilderness Character Monitoring:

- Provides on-the ground information to assess trends and make defensible decisions
- Provides regional and national information to evaluate policy effectiveness
- Communicates a positive and tangible vision for what wilderness is within the agency and with the public
- Allows managers to understand consequences of decisions and actions in wilderness
- Evaluates and documents effects of actions taken inside the wilderness and effects from threats outside the wilderness
- Provides solid information for planning
- Synthesizes data into single, holistic assessment
- Provide legacy information that will endure over time when personnel change
- Guards against legal vulnerability
- Creates improved on-the-ground wilderness stewardship



White pelicans on the Pelican Island Wilderness (FWS)

HISTORICAL BACKGROUND OF THE PELICAN ISLAND WILDERNESS

History of establishing the wilderness

Pelican Island National Wildlife Refuge was the first federal land designated for the protection of wildlife, making it the birthplace of the National Wildlife Refuge System. This Refuge was initially established to protect colonial birds during a time when market hunters, desiring feathers for the ladies' apparel industry, were slaughtering millions of birds. By the end of the 1800s, plume hunters, egg collectors, and vandals had nearly exterminated all the egrets, herons, and spoonbills from the 5.5-acre rookery island known as Pelican Island. Paul Kroegel, who was to later become the first Refuge Manager, protected the last nesting brown pelicans on the east coast of Florida and petitioned ornithologists and naturalists to help him. At the urging of researchers, concerned citizens, the Audubon Society, and the American Ornithologists' Union, President Theodore Roosevelt signed an unnumbered Executive Order that set aside Pelican Island as a preserve and breeding ground for native birds on March 14, 1903. The original establishing purpose of the refuge was to protect a nesting colony of brown pelicans on the island. Since its designation, Pelican Island National Wildlife Refuge has grown to over 5,400 acres and the entire refuge takes the name of the original rookery island. The designation of Pelican Island as a wildlife refuge was a catalyst for what is now the world's largest network of lands and waters managed for fish and wildlife – the National Wildlife Refuge System. Today the National Wildlife Refuge System comprises 150 million acres, protected within wildlife refuges in all 50 states.

On October 23, 1970 under Public Law 91-504, Pelican Island Proper (as the original 5.5-acre island is colloquially called) was designated a National Wilderness Area. Congress recognized that this special island deserved the added protection that wilderness designation offers and now the island represents a unique part of America's total wilderness. Although 16 refuge islands totaling 403 acres were proposed for Wilderness designation in 1963, 1968, and 1969, and although these proposals had local and congressional support, only the 5.5-acre island was eventually approved to be designated wilderness. This was because the U.S. Fish and Wildlife Service did not own the entire 403 acres under the proposal. According to the Swamplands Act of 1850, the State of Florida held the title to all of this land except the 5.5 acre island; the refuge merely leased these other acres from the State of Florida. Therefore, in 1970 this island was the only portion formally designated as wilderness and today is one of the smallest wilderness units in the National Wilderness Preservation System. The refuge continues to lease these lands from the State of Florida and manage them as refuge. Additional lands have been added to the refuge since its designation, but none of this new land has been designated as wilderness. In the 2000 Wilderness Review, no additional lands were found suitable for designation as wilderness within the Pelican Island National Wildlife Refuge.

Beyond being the first National Wildlife Refuge, the refuge is also designated as a National Historic Landmark, a Wetland of International Importance, and a candidate Marine Protected Area. Because of its status as the first federal area set aside specifically to protect wildlife, the refuge was designated a National Historic Landmark by the Secretary of the Interior in 1963. Thirty years later in 1993, Pelican Island Refuge was recognized by the Ramsar Convention on Wetlands as a Wetland of International Importance for its support of endangered species and large assemblages of migratory birds, as well as for its support of species at critical stages in their biological development. In 2000, the refuge was listed as a candidate Marine Protected Area for its protection of estuarine waters. But even without these special designations, it is apparent that Pelican Island National Wildlife Refuge holds a

truly unique part of the National Wildlife Refuge System; it contains a priceless gift – the heritage of a wild America that was, is, and will continue to be a legacy for future generations.

Refuge purposes

Currently over 5,400 acres, Pelican Island National Wildlife Refuge was established in 1903 on 5.5 acres “as a preserve and breeding ground for native birds” through an unnumbered Executive Order and expanded in 1909 by Executive Order 1014. The Pelican Island Refuge “shall be administered by him (the Secretary of the Interior) directly or in accordance with cooperative agreements and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon” [16 USC §664 (Fish and Wildlife Coordination Act)]. The refuge shall “conserve fish, wildlife, and plants, including those which are listed as endangered species or threatened species” [16 USC §1534 (Endangered Species Act)]. Further, the refuge serves “...the development, advancement, management, conservation, and protection of fish and wildlife resources... [16 USC §742(f)(a)(4) (Fish and Wildlife Act)] ...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services...” [16 USC §742(f)(b)(1) (Fish and Wildlife Act)].

Later, the Refuge Recreation Act was also applied to the refuge “...for (1) incidental fish and wildlife oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species....” [16 USC §460k-1 (Refuge Recreation Act)]. The existence of the refuge serves the “...conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans....” [16 USC §668dd(a)(2) (National Wildlife Refuge System Administration Act)]. Finally, the Pelican Island Wilderness Area “...shall be administered for the use and enjoyment of the American people in such manner as will leave them (wilderness areas) unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness....” [1964 Wilderness Act].

Objectives for the wilderness area differ from the general Pelican Island Refuge objectives and National Wildlife Refuge System Policy Update No. 12 since the area is closed to the public and is a very small area. The objectives for the Pelican Island Wilderness, as stated in the Wilderness Management Plan (1986) are as follows:

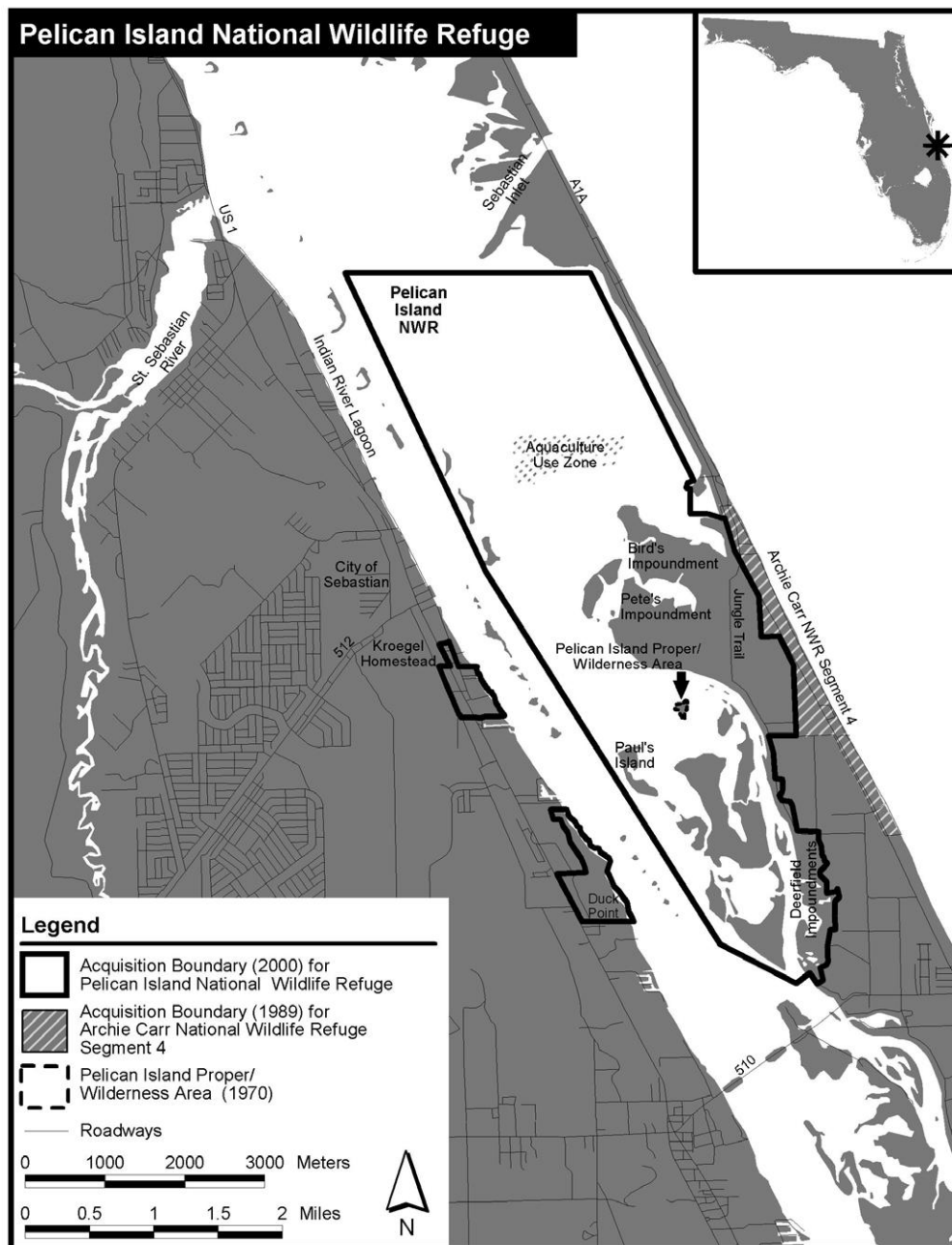
1. Manage the wilderness resource in such a manner as to leave it unimpaired for future use and enjoyment.
2. Perpetuate and, where necessary, restore the wilderness resource.
3. Insure that the land remains undeveloped.
4. Protect the island from human disturbance during the nesting season in order to protect and enhance the colonial nesting bird population.

Today the primary objective of refuge management, as stated in the Comprehensive Conservation Plan (2006) is to provide suitable nesting habitat and protection for all colonial nesting birds which use the island.

SETTING OF THE PELICAN ISLAND WILDERNESS

Geographic setting

The Pelican Island Wilderness is a single island (originally 5.5 acres, now 3.2 acres) within the Pelican Island National Wildlife Refuge. Pelican Island National Wildlife Refuge is located on the southeast coast of Florida in Indian River County near the town of Sebastian. The small wilderness island itself is located in the Indian River Lagoon, between a barrier island and mainland Florida. The Pelican Island Refuge spans over 5,400 acres, most of which is the waters of the Indian River Lagoon. The Pelican Island Wilderness portion of the refuge is colloquially called 'Pelican Island proper.'



Geographic location of the Pelican Island Wilderness. Figure from the refuge's Comprehensive Conservation Plan (2006).

Ecological setting

Pelican Island National Wildlife Refuge is part of the South Florida Ecosystem. Over the last 50 years, the South Florida Ecosystem has undergone dramatic changes, which are largely attributed to various human activities and growth. Despite the ongoing landscape alteration and rapidly expanding population, the scrub, hardwood hammocks, cypress swamps, salt marshes, mangrove islands, coral reefs, and seagrass beds of south Florida support one of the most ecologically diverse systems on the planet. The Indian River Lagoon, in which the Pelican Island Wilderness is located, is the most productive estuary in the country. The Lagoon has more species of plants and animals than any other estuary in North America, including over 2,200 animal species and over 2,100 plant species. The Indian River Lagoon is located along a transition zone between the warm-temperate climate to the north and a more subtropical climate to the south. This, along with the Indian River Lagoon's location at the confluence of freshwater and saltwater sources, makes the Pelican Island Wilderness uniquely situated to support a wide variety of resident and migratory species. Pelican Island National Wildlife Refuge serves as a critical repository of gene pools, species, and communities that is very important to the overall contribution and health of the Indian River Lagoon and the South Florida Ecosystem. Pelican Island Refuge provides an important ecological niche for fish, wildlife, and plant species.

Beyond the 14 federally listed species and despite limited data, the refuge is known to support hundreds of species of birds, mammals, reptiles and amphibians, fish, invertebrates, and plants, with many more species suspected to occur on the refuge. Colonial nesting bird use is the primary wildlife resource of the Pelican Island Wilderness. At least 16 different species of birds nest on the Pelican Island Wilderness. Populations vary from year to year depending upon weather and other unknown factors. Approximately 200-250 pairs of brown pelican and 150-200 pairs of wood storks nest on the island each year. Nesting activity is also good for the other avian species, including the anhinga, double-crested cormorant, great blue heron, great egret, snowy egret, tricolored heron, white ibis, and black-crowned night heron. Other species use Pelican Island during non-nesting seasons including white pelicans, a variety of shorebirds, gulls, and terns. During the summer months, post-nesting aggregations of magnificent frigatebirds and roseate spoonbills are seen on the island. Diamondback terrapins have also been seen on and around the island.

The Pelican Island Wilderness has a thin cover of mangroves with various weeds and grasses, primarily around the edge. The Wilderness includes an estimated 50% cover of red and black mangroves interspersed with smooth cord grass, salt grass, sea oxide daisy, prickly pear cactus, and Christmas berry. The vegetation of Pelican Island has been noticeably altered by years of continuous nesting activity. The mangroves are less dense, many trees are broken and dead, and the remaining trees are small with sparse foliage. Historical evidence indicates that this is a natural cyclic phenomenon.

Pelican Island National Wildlife Refuge's climate is subtropical and temperate. The average temperature is 67 degrees Fahrenheit with long, warm, humid summers and mild winters. Tropical storms impact the area, especially from May through mid-November. Generally, the area averages between 55 to 60 inches of rain annually, mostly in the summer and early fall.

DOCUMENTS CONSULTED

The documents listed below provided background information about the Pelican Island Wilderness that was used to write the background sections of this report and identify monitoring priorities. These documents, along with interviews of refuge staff, were the main sources used to aid in identifying measures and also supplied historical and present data for some of the measures. Below each document's citation is the location(s) where the document can be found.

- **Pelican Island National Wildlife Refuge: Comprehensive Conservation Plan.** U.S. Department of the Interior, Fish and Wildlife Service. Southeast Region. July 24, 2006.
 - <http://www.fws.gov/southeast/planning/CCP/PelicanIslandFinalPg.html>
 - Paper copies available at refuge headquarters.
- **Wilderness Management Plan: Pelican Island National Wildlife Refuge.** National Wildlife Refuge System. May 8, 1986.
- **Pelican Island: Wilderness Study Area, Pelican Island National Wildlife Refuge.** United States Department of Interior, Fish and Wildlife Service. 1960s (exact date unknown).
 - Paper copy can be found in biology files in "Wilderness Area" folder. Consult wildlife refuge specialist.
- **Pelican Island National Wildlife Refuge, Wilderness Review.** United States Department of Interior, Fish and Wildlife Service. 2000.
 - Paper copy can be found in biology files in "Wilderness Area" folder. Consult wildlife refuge specialist.
- **Wildlife and Habitat Management Review of Pelican Island National Wildlife Refuge.** Paul Tritaik, Refuge Manager of Pelican Island NWR. U.S. Fish and Wildlife Service. Vero Beach, Florida. July 31 - August 2, 2000.
 - S:\Refuge Complex\Pelican Island NWR\Bioreview
- **Pelican Island National Wildlife Refuge Habitat Management Plan.** U.S. Fish and Wildlife Service. Vero Beach, Florida. August 2012.
 - S:\Refuge Complex\Pelican Island NWR\HMP

STAFF CONSULTED

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- **Maury Eastwick**, Biological Science Technician, Pelican Island National Wildlife Refuge

PROCESS USED FOR IDENTIFYING MEASURES

An initial understanding of the Pelican Island National Wildlife Refuge was accomplished through tours from refuge staff and reading the refuge's Comprehensive Conservation Plan. This allowed me to begin drafting a list of measures that were specific to the monitoring needs and data availability of the refuge. Further acquaintance with the wilderness was gained by assisting the refuge's biological technician in bird count surveys and water quality surveys at and near the historic Pelican Island rookery.

Once a complete list of measures (i.e. at least one measure for every indicator) was drafted, it was submitted to the deputy project leader and wildlife refuge specialist (who also serves as the refuge manager of neighboring Archie Carr National Wildlife Refuge which is in the same complex as Pelican Island National Wildlife Refuge). The wildlife refuge specialist also serves as the biological program lead for the barrier island refuges. This staff member directed me to additional documents (see 'Documents Consulted') which were very helpful in identifying additional monitoring parameters and also provided baseline data. A final version of the final report was submitted to the project leader for review and approval. All offered feedback which was incorporated into this report. Many measures used at other wilderness areas in Florida were adapted for use at the Pelican Island Wilderness.

MEASURES USED FOR WILDERNESS CHARACTER MONITORING

Twenty-five measures were selected to determine trends in the wilderness' character over time for the Pelican Island Wilderness. Many measures were adapted from the U.S. Department of Agriculture's (Forest Service) *Technical Guide for Monitoring Selected Conditions Related to Wilderness Character* (2009) or the Bureau of Land Management's *Measuring Attributes of Wilderness Character: BLM Implementation Guide Version 1.5* (year unknown). The monitoring strategy described in this report follows the strategy described in *Keeping it Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System* (USDA, 2008). At least one unique measure was selected for each of the 13 indicators within the five qualities of wilderness character.

This section describes in detail the measures chosen to monitor the Pelican Island Wilderness. For each measure there is background information, collection protocol, baseline data, and the data source. Additional details for each measure include frequency, significant change, weight, condition of baseline data (good, caution, or poor), and data adequacy. The frequency of a measure is how often the data is collected and entered into the Wilderness Character Monitoring Database, usually every one or five years. The significant change tells how much a measure's data point must change from a previous data entry to suggest a change in trend of wilderness character for that measure. A measure's weight tells how important that measure is relative to the other measures within a particular indicator. The sum of the weights of each measure within an indicator equals 100%. The baseline condition conveys what the effects of this measure's data is on wilderness character: whether the data reflects a good or poor condition of wilderness character, or indicates that while the effect is neither good nor poor, there is concern about what this data says about the wilderness' character. In most cases the frequency, significant change, weight, and baseline condition for each measure were assigned by the wilderness fellow and approved by the wildlife refuge specialist and/or deputy project leader.

Data adequacy is defined as the reliability of the data to assess trends in the measure. The intention behind evaluating data adequacy is to understand where improvements in data collection need to be made and not to evaluate how well an individual measure represents a particular aspect of wilderness character. For example, if the data indicate a degrading trend in a particular indicator and the data adequacy is deemed "low," this would suggest that the trend be interpreted conservatively, not discounted entirely, and that greater efforts be expended in future years to acquire more or better data. To determine the data adequacy of each measure for this report, two related but distinct aspects of data adequacy are subjectively evaluated: data quantity and data quality.

Data quantity refers to the level of confidence that all appropriate data records have been gathered. Data quality refers to the level of confidence about the source(s) of data and whether the data are of sufficient quality to reliably identify trends in the measure. Data quantity and quality is subjectively evaluated for each measure according to the following categories.

Data Quantity

Complete

This category indicates a high degree of confidence that all data records have been gathered. For example, to assess the occurrence of nonindigenous invasive plants, a complete inventory of the wilderness was conducted or all likely sites were visited. This category is represented graphically by a solid left half-circle.

Partial

This category indicates that some data is available, but the data is generally considered incomplete (such as with sampling). For example, to assess the occurrence of nonindigenous invasive plants, a partial inventory was conducted or a sampling of sites was conducted where these plants are likely to occur. This category is represented graphically by a left half-circle with a thick horizontal line in the middle.

Insufficient

This category indicates even less data records have been gathered or perhaps this measure is not dependent on actual field data. For example, no inventory for nonindigenous invasive plants has been conducted, and visitor use was not assessed anywhere. This category is represented graphically by an empty left half-circle.

Data Quality

High







This category indicates a high degree of confidence that the quality of the data can reliably assess trends in the measure. For example, data on the occurrence of nonindigenous invasive plants is from ground-based inventories conducted by qualified personnel; for visitor use, data would come from visitor permit data. This category is represented graphically by a solid right half-circle.

Moderate




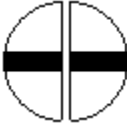
This category indicates a moderate degree of confidence about the quality of the data. For example, data on invasive plants could come from national or regional databases; for visitor use, data could come from direct visitor contacts. This category is represented graphically by a right half-circle with a thick horizontal line in the middle.

Low

This category indicates a low degree of confidence about the quality of the data. For example, data on invasive plants and visitor use could come from professional judgment. This category is represented graphically by an empty right half-circle.

Data Adequacy					
Data Quantity			Data Quality		
Complete	Partial	Insufficient	High	Moderate	Low
					

Graphical representation of the different categories of data quantity and data quality.

Untrammelled Quality <i>Wilderness is essentially unhindered and free from modern human control or manipulation.</i>				
Monitoring Question	Indicator	Measure	Data Adequacy	Weight
What are the trends in actions that control or manipulate the “earth and its community of life” inside wilderness?	Actions authorized by the Federal land manager that manipulate the biophysical environment	1-1. Amount of vegetation planted on/around the island		33%
		1-2. Cubic feet of shell, sand, or other hard material placed on/around the island		33%
		1-3. Index of other trammeling management actions		34%
	Actions <u>not</u> authorized by the Federal manager that manipulate the biophysical environment	1-4. Index of unauthorized actions that intentionally manipulate the biophysical environment		100%

Measure 1-1: Amount of vegetation planted on/around the island

Background & Context

This action is carried out as part of the shoreline stabilization efforts of the Pelican Island Wilderness. This action is necessary to preserve/restore the natural character of the wilderness; the natural character is severely degraded by erosion caused by unnatural means (see *Measure 2-1*).

From 1943 to 1996, Pelican Island eroded from 5.5 acres to about 2.2 acres. In response, shoreline stabilization efforts were undertaken by refuge management staff. These efforts are expected to reduce the loss of lands from erosion, aid in the accretion of sediment, and help in the revegetation of the original 5.5 acres. This began with mangrove planting in 1996 that proved unsuccessful. From 2000-2001 mangrove planting, in conjunction with cordgrass (*Spartina alterniflora*) planting and loose shell placement, was conducted and successfully restored some of the island's acreage. These actions were completed on a total of 1,095 feet of shoreline (165 feet along the northern shore in 2000 plus 930 feet around the north and west shore in 2001). The most recent stabilization efforts were completed in 2006 when fossilized shell and sand was delivered to the island in conjunction with mangrove and cordgrass plantings.

Depending on the success of these shoreline stabilization efforts, additional actions to limit erosion may or may not be necessary to protect this historic rookery. Estimates show the Island grew to 2.8 acres in 2004 and is presently stable at 3.2 acres. As stated in the refuge's Comprehensive Conservation Plan (2006), the refuge will continue to acquire all applicable permits related to protecting the Pelican Island proper rookery, including earthmoving activities associated with shoreline stabilization.

Measure Description & Collection Protocol

This measure tracks the amount of vegetation planted on or around the Pelican Island wilderness as part of efforts to stabilize the island's shoreline. This includes the number of seeds and seedlings planted. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. If no stabilization efforts are undertaken in a particular year, an entry of 'zero' (0) will be entered for the data that year. This data is required as part of the permitting process for stabilization projects; therefore it will not require any additional refuge effort to compile this data for use in the Wilderness Character Monitoring Database. It should be noted that the survival rate of these plantings is not always 100%, but this is irrelevant to this measure because it is the act (or attempt) of manipulation that is monitored as a degradation of wilderness character in this measure.

Data Source

Wildlife refuge specialist

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Data Adequacy

All records of the number of seeds and seedlings planted for shoreline stabilization are consulted for in this measure. These actions are carried out by refuge staff who track the number of seeds and seedlings with a high degree of accuracy. Therefore the quality of this data is high.

Significant Change

Any change in this data would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Measure 1-1	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2006:	12,078 [55 red mangroves (<i>Rhizophora mangle</i>), 23 black mangroves (<i>Avicennia germinanas</i>), and 12,000 cordgrass seedlings (<i>Spartina alterniflora</i>)]
2012 Baseline:	0 (no stabilization efforts were implemented in 2012)
Baseline Condition:	Good
Data Source:	Refuge restoration files (permitting docs, monitoring docs) S:\Refuge Complex\Pelican Island NWR\Restoration Projects\Pelican Island Proper



Volunteers and refuge staff planting cordgrass (*Spartina alterniflora*) on the Pelican Island Wilderness as part of island stabilization and restoration efforts (FWS)

Measure 1-2: Cubic feet of shell, sand, or other hard material placed on/around the island

Background & Context

This action is carried out as part of the shoreline stabilization efforts of the Pelican Island Wilderness. This action is necessary to preserve/restore the natural character of the wilderness; the natural character is severely degraded by erosion caused by unnatural means (see *Measure 2-12*).

From 1943 to 1996, Pelican Island eroded from 5.5 acres to about 2.2 acres. In response, shoreline stabilization efforts were undertaken by refuge management staff. These efforts are expected to reduce the loss of lands from erosion, aid in the accretion of sediment, and help in the revegetation of the original 5.5 acres. This began with mangrove planting in 1996 that proved unsuccessful. From 2000-2001 loose shell placement, in conjunction with mangrove and cordgrass (*Spartina alterniflora*) planting, was conducted and successfully restored some of the island's acreage. These actions were completed on a total of 1,095 feet of shoreline (165 feet along the northern shore in 2000 plus 930 feet around the north and west shore in 2001). The most recent stabilization efforts were completed in 2006 when fossilized shell and sand was delivered to the island in conjunction with mangrove and cordgrass plantings.

Depending on the success of these shoreline stabilization efforts, additional actions to limit erosion may or may not be necessary to protect this historic rookery. Estimates show the Island grew to 2.8 acres in 2004 and is presently stable at 3.2 acres. As stated in the refuge's Comprehensive Conservation Plan (2006), the refuge will continue to acquire all applicable permits related to protecting the Pelican Island proper rookery, including earthmoving activities associated with shoreline stabilization.

Measure Description & Collection Protocol

This measure tracks the amount, in cubic feet, of shell (loose or bagged) or other hard material (i.e. sand) placed on or around the Pelican Island wilderness as part of efforts to stabilize the island's shoreline. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. This data is required as part of the permitting process for stabilization projects; therefore it will not require any additional refuge effort to compile this data for use in the Wilderness Character Monitoring Database.

Data Source

Wildlife refuge specialist

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Data Adequacy

All records of the amount of stabilizing material placed on/around Pelican Island are consulted for in this measure. These actions are carried out by refuge staff who track this data with a high degree of accuracy. Therefore the quality of this data is high.

Significant Change

Any change in this data would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Measure 1-2	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2000:	930 cubic feet of fossilized shell
2004:	31,320 cubic feet [260 cubic yards of fossilized shell and 900 cubic yards of sand]
2006:	33,750 cubic feet [250 cubic yards of fossil shell and 1,000 cubic yards sand]
2012 Baseline:	0 (no stabilization efforts were implemented in 2012)
Baseline Condition:	Good
Data Source:	Refuge restoration files (permitting docs, monitoring docs) S:\Refuge Complex\Pelican Island NWR\Restoration Projects\Pelican Island Proper



Shell installation on the Pelican Island Wilderness (FWS)

Measure 1-3: Index of other trammeling management actions

Background & Context

Because of the sensitivity of bird populations residing on the Pelican Island Wilderness, visits to the island by refuge personnel are rare and only conducted in the most extreme circumstances. Wildlife monitoring is conducted from the lagoon outside of a 410-foot buffer zone around the wilderness island. Therefore trammeling that might be the result of active management is rare in the Pelican Island Wilderness, aside from those associated with shoreline stabilization (a management priority for the refuge). Actions that should be counted in this measure include any invasive species removal; actions to manage pathogens, soil, or water; wildfire suppression; and species trapping or stocking.

Measure Description & Collection Protocol

This single measure accounts for all other authorized trammeling actions that are not monitored by other measures. Each trammeling action is scored according to whether a Minimum Requirements Analysis (MRA) (see Appendix E) was completed for the action, the extent that the activity affects the community of life (spatial extent and species affected), and the temporal extent of the activity. The table below describes how these trammeling actions are scored. The sum of these scores generates a total score for each trammeling action; the summed score for all trammeling activities is reported in Wilderness Character Monitoring Database. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Authorized Trammeling Action	
Question About Action	Score
Was a MRA completed?	0 – yes 1 – no
To what extent does the activity affect the community of life in wilderness?	1 – the activity affected only a single species or an area of less than one acre 2 – the activity affected or has the potential to affect many species or an area of more than one acre 3 – the activity affected or has the potential to affect many species and an area of more than one acre
Length of time?	1 – the activity occurred on 1-5 days 2 – the activity occurred on 5-120 days 3 – the activity occurred throughout the year or more than 120 days in a year

Definitions

- *Action* - the implementation of an intentional decision to manipulate the biophysical environment.
- *Minimum Requirements Analysis (MRA)* – a decision-making process, documented in writing, that agencies use to determine if proposed refuge management activities conducted in wilderness are necessary to administer the area as wilderness and to accomplish the purposes of the refuge, including Wilderness Act purposes. This document helps land managers make informed stewardship decisions in wilderness. Required by law and agency policy for any management actions that might be undertaken in a wilderness area. Refer to Appendix E.

Data Source

Wildlife refuge specialist, project leader

Data Adequacy

All records of management actions that might be considered trammeling are reported for this measure. Because active management is a rare occurrence on the wilderness island due to the sensitivity of bird populations, these actions are monitored with a high degree of accuracy by refuge staff. Therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Significant Change

Any change in this data would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Measure 1-3	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0 (no other trammeling actions occurred in 2012)
Baseline Condition:	Good
Data Source:	Wildlife refuge specialist

Measure 1-4: Index of unauthorized actions that intentionally manipulate the biophysical environment

Background & Context

At this time, no known unauthorized intentional manipulations occur in the Pelican Island Wilderness. Examples of actions that would be accounted for in this measure would be unauthorized actions by agencies, citizen groups, or individuals that manipulate the biophysical environment. Such actions would require a Special Use Permit.

Measure Description & Collection Protocol

This single measure will account for any unauthorized intentional manipulations in the Pelican Island Wilderness. Each such trammeling is scored according to the extent that the activity affects the community of life (spatial extent and species affected) and the temporal extent of the activity. The table below describes how these trammeling actions are scored. The sum of these scores generates a total score for each trammeling action; the summed score for all trammeling activities is reported in Wilderness Character Monitoring Database. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Unauthorized Trammeling Action	
Question About Action	Score
To what extent does the activity affect the community of life in wilderness?	1 – the activity affected only a single species or an area of less than one acre 2 – the activity affected or has the potential to affect many species or an area of more than one acre 3 – the activity affected or has the potential to affect many species and an area of more than one acre
Length of time?	1 – the activity occurred on 1-5 days 2 – the activity occurred on 5-120 days 3 – the activity occurred throughout the year or more than 120 days in a year

Definitions

- *Action* - the implementation of an intentional decision to manipulate the biophysical environment.

Data Source

Wildlife refuge specialist, project leader

Data Adequacy

Without the proper special use permit, these actions would be illegal. Because of this illegal nature, it is less likely that all violations will be known by refuge staff. An absence of law enforcement personnel patrolling the island further contributes to this lack of data. Therefore the data quantity is partial and the data quality is moderate.



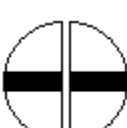

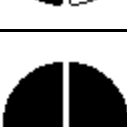
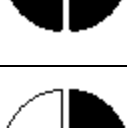
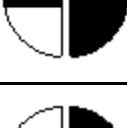


Frequency




Data is entered into the Wilderness Character Monitoring Database annually.

Significant Change

Any change in this data would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Measure 1-4	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0 (no known unauthorized trammeling actions were known to occur in 2012)
Baseline Condition:	Good
Data Source:	Wildlife refuge specialist

Natural Quality <i>Wilderness ecological systems are substantially free from the effects of modern civilization.</i>				
Monitoring Question	Indicator	Measure	Data Adequacy	Weight
What are the trends in terrestrial, aquatic, and atmospheric natural resources inside wilderness?	Plant and animal species and communities	2-1. Brown pelican flight count (highest for the year)		25%
		2-2. Wood stork flight count (highest for the year)		25%
		2-3. Index of non-native plant species in wilderness		25%
		2-4. Index of non-native animal species in wilderness		25%
	Physical resources	2-5. Air quality: Ozone air pollution		14%
		2-6. Air quality: Total nitrogen wet deposition		14%
		2-7. Air quality: Total sulfur wet deposition		14%
		2-8. Air quality: Visibility		14%
		2-9. Water quality: dissolved oxygen		14%

		2-10. Water quality: salinity		15%
		2-11. Water quality: pH		15%
	Biophysical processes	2-12. Wilderness acreage		100%

Measure 2-1: Brown pelican flight count (highest for the year)

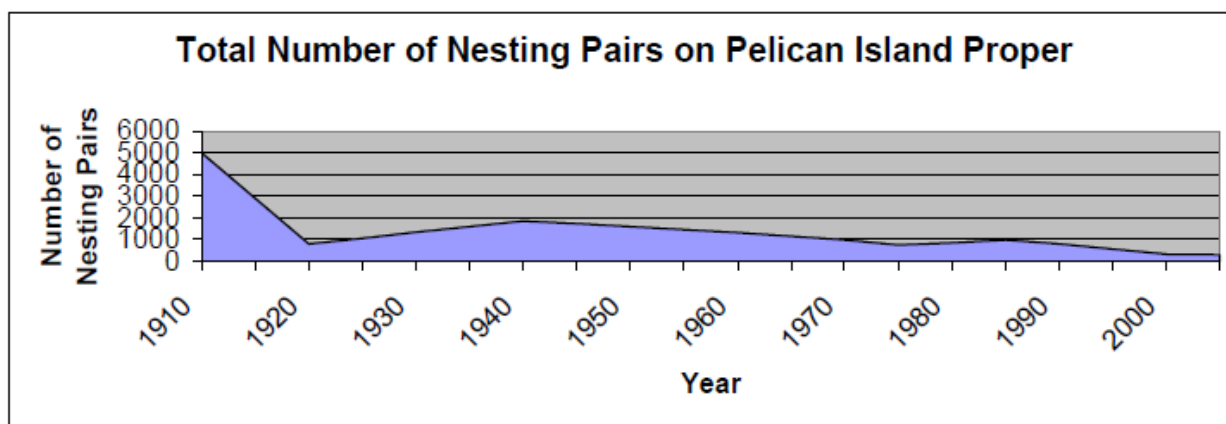
Background & Context

In 1903, when the refuge was established, the 5.5-acre Island functioned as a brown pelican rookery with some 10,000 pelicans counted during the peak nesting season. At that time, Paul Kroegel (the first refuge manager) focused on keeping market hunters and egg collectors from decimating the population. One hundred years later, more than a dozen species nest on the Island with less than 100 nesting pairs of pelicans on the Island in the spring. From 1910 to 1999, the total number of nesting pairs has decreased by nearly 94 percent. Even from 1995 to 1999, the total number of nesting pairs has decreased by nearly 44 percent. Since 1903 when Pelican Island was the first federal bird reservation it has been an active colony site for at least 16 species. The brown pelican (*Pelecanus occidentalis*) and wood stork (*Mycteria americana*) are particularly important species for monitoring at the Pelican Island Wilderness – the brown pelican because of its historical significance to the refuge, and the wood stork because of its endangered status under the Endangered Species Act.

In the past, nesting pairs of brown pelicans and wood storks were monitored on the Pelican Island Wilderness. Recently though, this data collection was substituted for “flight line” counts which is supposed to provide an estimate of the number of nesting pairs in a colony by measuring the flight rate of adults leaving and entering. If nesting pair counts are ever collected on the island again in the future (which is highly recommended), then this data should be included in the Wilderness Character Monitoring Database as either a replacement for or a supplement to the flight line data.

Species	Number of Nesting Pairs								
	1910	1920	1941	1965	1976	1986	1995	1999	2004
Brown Pelican	5,000	800	500	300	300	200	153	80	47

Data from Comprehensive Conservation Plan (2006)



Total number of nesting pairs (all species). Data from Comprehensive Conservation Plan (2006)

Measure Description & Collection Protocol

Flight-line counts are conducted twice a month throughout the year (although the protocol only requires these counts to be done February through June). To conduct a flight-line count, observers count all birds flying to and from the colony from all directions over a specified period of time. This method provides data on the types of species of birds using the rookery and an estimate of the quantity of species using the rookery. Protocol can be found at S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets (Document is named "Pelican Island NWR Bird Survey Protocol 2012.pdf). The highest total flight line count (north side plus south side) for the brown pelican during the year of interest is recorded in the Wilderness Character Monitoring Database. Over time, a decrease in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

Wildlife refuge specialist, refuge biology files
S:\Refuge Complex\Pelican Island
NWR\Birds\PINWR protocols and
datasheets\Bird Survey Protocol Datasheets

Significant Change

A 10% increase or decrease in this data would be significant enough change to be interpreted as an improving or degrading trend in wilderness character for this indicator.

Data Adequacy

All records of flight line count data are consulted for this measure. Flight line counts are conducted by highly knowledgeable staff or volunteers, therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.



Brown pelicans (FWS)

Measure 2-1	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	91*
Baseline Condition:	Poor
Data Source:	S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets\Bird Survey Protocol Datasheets\Flight Line Count Survey (Document is named "Cumulative Data")

* Date of data is 1/30/12 and 10/2/12 (both dates had the highest count for the year at 91)

Measure 2-2: Wood stork flight count (highest for the year)

Background & Context

The only listed species in the Pelican Island Wilderness, the federally endangered wood stork is of special interest to wilderness managers. Wood storks have been nesting on the Pelican Island Wilderness since 1950. The Pelican Island colony has been one of the most consistently active rookeries in the State of Florida. Pelican Island NWR contributes to the recovery efforts for the wood stork in many ways through the provision of nesting, roosting, and foraging areas. Despite this, wood stork nesting on Pelican Island proper has declined from 900 in 1980 to 85 in 1990. As of 2006, between 90 and 150 pairs of wood storks nest on Pelican Island proper each year. Since 1903 when Pelican Island was the first federal bird reservation it has been an active colony site for at least 16 species. The brown pelican (*Pelecanus occidentalis*) and wood stork (*Mycteria americana*) are particularly important species for monitoring at the Pelican Island Wilderness – the brown pelican because of its historical significance to the refuge, and the wood stork because of its endangered status under the Endangered Species Act.

In the past, nesting pairs of brown pelicans and wood storks were monitored on the Pelican Island Wilderness. Recently though, this data collection was substituted for “flight line” counts which is supposed to provide an estimate of the number of nesting pairs in a colony by measuring the flight rate of adults leaving and entering. If nesting pair counts are ever collected on the island again in the future (which is highly recommended), then this data should be included in the Wilderness Character Monitoring Database as either a replacement for or a supplement to the flight line data.

Species	Number of Nesting Pairs								
	1910	1920	1941	1965	1976	1986	1995	1999	2004
Wood Stork	--	--	--	200	250	150	220	135	167

Data from Comprehensive Conservation Plan (2006)

Measure Description & Collection Protocol

Flight-line counts are conducted twice a month throughout the year (although the protocol only requires these counts to be done February through June). To conduct a flight-line count, observers count all birds flying to and from the colony from all directions over a specified period of time. This method provides data on the types of species of birds using the rookery and an estimate of the quantity of species using the rookery. Protocol can be found at S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets (Document is named “Pelican Island NWR Bird Survey Protocol 2012.pdf”). The highest total flight line count (north side plus south side) for the wood stork during the year of interest is recorded in the Wilderness Character Monitoring Database. Over time, a decrease in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

Wildlife refuge specialist, refuge biology files
S:\Refuge Complex\Pelican Island
NWR\Birds\PINWR protocols and
datasheets\Bird Survey Protocol Datasheets

Data Adequacy

All records of flight line count data are consulted for this measure. Flight line counts are conducted by highly knowledgeable staff or volunteers, therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Significant Change

A 10% increase or decrease in this data would be significant enough change to be interpreted as an improving or degrading trend in wilderness character for this indicator.



Wood stork (FWS)

Measure 2-2	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	4*
Baseline Condition:	Poor
Data Source:	S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets\Bird Survey Protocol Datasheets\Flight Line Count Survey (Document is named "Cumulative Data")

* Date of data is 2/10/12 and 9/15/12 (both dates had the highest count for the year at 4)

Measure 2-3: Index of non-native plant species in wilderness

Background & Context

Exotic plant establishment on the Pelican Island Wilderness is sparse. Surveying for and removal of invasive plants happens opportunistically; if refuge staff are on the island and invasives are encountered, they are removed by hand. Exotic plants that are found on the Pelican Island Wilderness are listed in the table below.

The Florida Exotic Pest Plant Council categorized exotic plants as either Category I or II exotic invasive pest plants. Category I plants are altering native plant communities by displacing native species, changing community structure or ecological functions, or hybridizing with native species. This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused. Category II plants have increased in abundance or frequency, but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I if ecological damage is demonstrated.

Common Name(s)	Scientific Name	Florida Exotic Pest Plant Council Category
Brazilian pepper	<i>Schinus terebinthifolius</i>	I

Measure Description & Collection Protocol

This measure provides data on the number of invasive species in wilderness and scores each species based on the threat it poses to wilderness character. A threat level score posed by each non-native plant species found in wilderness is assigned according to the following table and definitions. Threats considered include those posed to the critical habitat and/or food sources of sensitive and/or rare species; terrestrial, aquatic, and atmospheric natural resources and processes; etc. The score for each species is summed and reported in the Wilderness Character Monitoring Database. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.



Brazilian pepper on the Pelican Island Wilderness

Non-Native Plant	Threat Level	Score	Total
	Low/ None	1	
	Medium	2	
	High	3	

Definitions

- **Low**
 - The species is known to exist on less than 25% of the wilderness. OR
 - The species poses no threat to the critical habitat and/or food sources of rare species or other species of conservation concern.
- **Medium**
 - The species is known to exist on 25-50% of the wilderness. OR
 - The species poses moderate threats to the critical habitat and/or food sources of rare species or other species of conservation concern; populations of sensitive species are not significantly impacted by the exotic species; the exotic species is unlikely to cause extinction of sensitive/rare species.
- **High**
 - The species is known to exist on more than half of the wilderness. OR
 - The species poses severe threats to the critical habitat and/or food sources of rare species or other species of conservation concern; populations of sensitive species are significantly impacted by the exotic species; the exotic species has the potential to cause extinction of sensitive/rare species.

Data Source

Wildlife refuge specialist

Data Adequacy

Invasive plant presence in wilderness is not known until that species has become established. Sometimes it can be years before it is known that a new invasive has become established. Therefore, the quantity of this data is partial. Because professional judgment is used to assign a threat level for each species, the quality of this data is moderate.

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Significant Change

Any change to/from one of the following categories would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Overall Wilderness Threat Score	Status
0-3 <i>and</i> all "Low"	Good
4-10 <i>or</i> any "Medium"	Caution
> 10 <i>or</i> any "High"	Poor

Detailed Data: Non-native species scoring		
Species	Score	Comments
Brazilian pepper	1 - Low	<10 sites

Measure 2-3 Wilderness Character Monitoring Database: Reported Data	
2012 Baseline:	1
Baseline Condition:	Good
Data Source:	Wildlife refuge specialist

Measure 2-4: Index of non-native animal species in wilderness

Background & Context

The most threatening non-native animal that existed on the Pelican Island Wilderness was the black rat (*Rattus rattus*). These were all exterminated from the island in 2007. Non-native animals that are found on the Pelican Island Wilderness are listed in the table below.

Common Name(s)	Scientific Name
Red imported fire ant	<i>Solenopsis invicta</i> Buren

Measure Description & Collection Protocol

This measure provides data on the number of invasive species in wilderness and scores each species based on the threat it poses to wilderness character. A threat level score posed by each non-native animal species found in wilderness is assigned according to the table below. Threats considered include those posed to the critical habitat and/or food sources of sensitive and/or rare species; terrestrial, aquatic, and atmospheric natural resources and processes; etc. The score for each species is summed and reported in the Wilderness Character Monitoring Database.

Non-Native Animal	Threat Level	Score	Total
	Low/ None	1	
	Medium	2	
	High	3	

Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Definitions

- **Low**
 - The species is known to exist on less than 25% of the wilderness. OR
 - The species poses no threat to the critical habitat and/or food sources of rare species or other species of conservation concern.
- **Medium**
 - The species is known to exist on 25-50% of the wilderness. OR
 - The species poses moderate threats to the critical habitat and/or food sources of rare species or other species of conservation concern; populations of sensitive species are not significantly impacted by the exotic species; the exotic species is unlikely to cause extinction of sensitive/rare species.
- **High**
 - The species is known to exist on more than half of the wilderness. OR
 - The species poses severe threats to the critical habitat and/or food sources of rare species or other species of conservation concern; populations of sensitive species are significantly impacted by the exotic species; the exotic species has the potential to cause extinction of sensitive/rare species.

Data Source

Wildlife refuge specialist

Data Adequacy

All records of invasive animals in wilderness are consulted for this measure. The species of invasive animals present in wilderness is common refuge knowledge and is therefore very accurate data. But because professional judgment is used to assign a threat level for each species, the quality of this data is moderate.

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Significant Change

Any change to/from one of the following categories would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Overall Wilderness Threat Score	Status
0-3 <i>and</i> all "Low"	Good
4-10 <i>or</i> any "Medium"	Caution
> 10 <i>or</i> any "High"	Poor

Detailed Data: Non-native species scoring		
Species	Score	Comments
Red imported fire ant	1 – Low*	Not known to have substantially degrading impacts to wilderness character

*Note: Refuge staff expressed concern at the lack of knowledge on the potential impacts of the red imported fire ant on nesting birds. It is suggested that further research should go into assessing the potential effects, and if this research is conducted it should be considered when scoring for wilderness character impacts.

Measure 2-4	
Wilderness Character Monitoring Database: Reported Data	
2012 Baseline:	1
Baseline Condition:	Good
Data Source:	Wildlife refuge specialist

Measure 2-5: Air quality - Ozone air pollution

Background & Context

According to the Florida Department of Environmental Protection, the air pollutants of major concern in Florida are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. The primary sources of these pollutants are vehicle emissions, power plants, and industrial activities.

Measure Description & Collection Protocol

Fourth highest 8-hour average ozone concentration in parts per billion (ppb). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages. There are 22 ozone monitoring stations within 200 km of the Pelican Island Wilderness. The closest is in the Indian River Lagoon which is about 0.75 km from the refuge.

Data Source

National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.

Significant Change

Any change to/from one of the following categories would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Data Adequacy

Ozone data comes from a monitor within close proximity, therefore the quantity of this data is complete. Data comes from very accurate data collection stations and therefore the quality of this data is high.

Ozone ppb	Status
< 60 ppb	Good
61 - 75	Moderate
> 76	Significant Concern

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Measure 2-5	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2001-2005:	69.7
2012 Baseline:	68.0*
Baseline Condition:	Poor
Data Source:	Jill Webster, USFWS Environmental Scientist, Branch of Air Quality

*Date of data is 2005-2009

Measure 2-6: Air quality - Total nitrogen wet deposition

Background & Context

According to the Florida Department of Environmental Protection, the air pollutants of major concern in Florida are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. The primary sources of these pollutants are vehicle emissions, power plants, and industrial activities.

Measure Description & Collection Protocol

Concentration of nitrogen in atmospheric wet deposition (i.e. rain, snow), in units kilogram per hectare (kg/ha). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages. Interpolated values come from stations within 200 km (Kennedy Space Center [FL99]; Orlando [FL32]; Verna Well Field [FL41]) and 300 km (Chassahowitzka National Wildlife Refuge [FL05]; Everglades National Park [FL11]; Bradford Forest [FL03]) of the Pelican Island Wilderness.

Data Source

National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.

Data Adequacy

For this data, since no nitrogen wet deposition monitors are within close proximity, values have been interpolated between monitors within the region. Therefore the quantity of this data is partial. Data comes from very accurate data collection stations and therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Significant Change

This value is based on interpolated data; therefore a trend for this measure cannot be assessed. However, one can consider whether the numerical value for this indicator is increasing or decreasing over the averaging periods. Based on the following table the status of the air can be noted.

Total nitrogen (kg/ha)	Status
<1 kg/ha	Good
1 - 3	Moderate
> 3	Significant Concern

Measure 2-6	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2001-2005:	3.8
2012 Baseline:	2.8*
Baseline Condition:	Caution
Data Source:	Jill Webster, USFWS Environmental Scientist, Branch of Air Quality

*Date of data is 2005-2009

Measure 2-7: Air quality - Total sulfur wet deposition

Background & Context

According to the Florida Department of Environmental Protection, the air pollutants of major concern in Florida are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. The primary sources of these pollutants are vehicle emissions, power plants, and industrial activities.

Measure Description & Collection Protocol

Concentration of sulfur in atmospheric wet deposition (i.e. rain, snow), in units kilogram per hectare (kg/ha). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages. Interpolated values come from stations within 200 km (Kennedy Space Center [FL99]; Orlando [FL32]; Verna Well Field [FL41]) and 300 km (Chassahowitzka National Wildlife Refuge [FL05]; Everglades National Park [FL11]; Bradford Forest [FL03]) of the Pelican Island Wilderness.

Data Source

National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.

Data Adequacy

For this data, since no sulfur wet deposition monitors are within close proximity, values have been interpolated between monitors within the region. Therefore the quantity of this data is partial. Data comes from very accurate data collection stations and therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Significant Change

This value is based on interpolated data; therefore a trend for this measure cannot be assessed. However, one can consider whether the numerical value for this indicator is increasing or decreasing over the averaging periods. Based on the following table the status of the air can be noted.

Total sulfur (kg/ha)	Status
<1 kg/ha	Good
1 - 3	Moderate
> 3	Significant Concern

Measure 2-7	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2001-2005:	4.7
2012 Baseline:	3.3*
Baseline Condition:	Poor
Data Source:	Jill Webster, USFWS Environmental Scientist, Branch of Air Quality

*Date of data is 2005-2009

Measure 2-8: Air quality - Visibility

Background & Context

According to the Florida Department of Environmental Protection, the air pollutants of major concern in Florida are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. The primary sources of these pollutants are vehicle emissions, power plants, and industrial activities.

Measure Description & Collection Protocol

Scenic conditions that determine how well and how far a wilderness visitor can see based on the amount of small particles in the air, in units deciview (Dv). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages. Interpolated values come from stations within 200 km (Chassahowitzka [CHAS1] and Everglades National Park [EVER1]) of the Pelican Island Wilderness.

Data Source

National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.

Data Adequacy

For this data, since no visibility monitors are within close proximity, values have been interpolated between monitors within the region. Therefore the quantity of this data is partial. Data comes from very accurate data collection stations and therefore the quality of this data is high.

Significant Change

This value is based on interpolated data; therefore a trend for this measure cannot be assessed. However, one can consider whether the numerical value for this indicator is increasing or decreasing over the averaging periods. Based on the following table the status of the air can be noted.

Visibility (dV)	Status
< 2 dV	Good
2 - 8	Moderate
> 8	Significant Concern

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Measure 2-8	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2001-2005:	8.5
2012 Baseline:	10.8*
Baseline Condition:	Poor
Data Source:	Jill Webster, USFWS Environmental Scientist, Branch of Air Quality

*Date of data is 2005-2009

Measure 2-9: Water quality - Dissolved oxygen

Background & Context

The Pelican Island Wilderness is located in the Indian River Lagoon, one of the most diverse estuaries in North America. The lagoon was designated an "estuary of national significance" in 1989. Because of the increased human development around the lagoon, the quality of its waters has been unnaturally altered. Oxygen depleting products, such as those used for landscaping and from automobiles, eventually end up in the lagoon via stormwater runoff. Excess nutrients from these products can result in an excessive algae growth that can deplete the dissolved oxygen to levels fatal to other marine life. Many land-based resources of the Pelican Island Wilderness depend on the quality of the surrounding lagoon waters, which is an essential foraging habitat for bird species residing on the island.

Measure Description & Collection Protocol

Water quality data is collected by refuge staff and given to the Marine Resources Council as part of the Indian River Lagoonwatch Water Quality Testing Program. This data is collected in cooperation with the Florida Department of Environmental Regulation and is supported by the US EPA. The only data that is reported for this measure is the data that is taken from the data-collection station closest to the Pelican Island Wilderness (Site # IR 3270, at Paul's Island). The annual average dissolved oxygen is reported in the Wilderness Character Monitoring Database. Depending on the data, an increase or decrease in this value could signify an improving or degrading trend in wilderness character for this indicator (see significant change).

Data Source

Wildlife refuge specialist, biological technician, Marine Resources Council's Indian River Lagoonwatch Water Quality Testing Program. Data can be found online at <http://www.mrcirl.org/water/watch.html> (select the desired year under 'Access Water Quality Maps and Data Online;' report data for site # IR 3270). Data can also be found on the refuge's shared drive in S:\Refuge Complex\Water Quality Monitoring\2013 Data.

Data Adequacy

All water quality data collected at the Paul's Island data collection site (site # IR 3270) are consulted for this measure. Data is accurately collected by refuge staff and reported to the Marine Resources Council.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Significant Change

The Marine Resources Council notes the conditions of waters based readings within the ranges below. Any change to/from one of the following categories would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

DO (mg/l)	Status
0 - 3	Poor
3.1 - 5	Caution
> 5	Good

Detailed Data: Dissolved oxygen data collected at site IR3270 in 2012	
Date	DO (mg/l)
January	!
2/15	6.35
3/2	4.65
3/9	6.3
3/23	6.3
4/6	6.7
4/13	6.35
May	!
June	!
7/6	4.65
7/30	5.1
August	!
9/14	6.15
10/3	5.15
November	!
12/19	6.2
Average: 5.81	

Measure 2-9	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2011:	5.56*
2012 Baseline:	5.81**
Baseline Condition:	Good
Data Source:	Biological Technician, Indian River Lagoonwatch Water Quality Testing Program

*2011 Data was only available for September-December

**This data was incomplete because not all data had been entered into the online data archives. Please update this data when it becomes available.

Measure 2-10: Water quality - Salinity

Background & Context

The Pelican Island Wilderness is located in the Indian River Lagoon, one of the most diverse estuaries in North America. The lagoon was designated an "estuary of national significance" in 1989. Because of the increased human development around the lagoon, the quality of its waters has been unnaturally altered. Altered hydrology caused by human development has changed the amount of freshwater running into the lagoon after a storm. This can have an impact on the salinity of the Indian River Lagoon which can have adverse effects on aquatic organisms inhabiting the Indian River Lagoon. For example, large freshwater inputs, particularly after storms, can impede clam growth and spawning and have deleterious impacts to seagrass, the most important health indicator of the lagoon. Many land-based resources of the Pelican Island Wilderness depend on the quality of the surrounding lagoon waters, which is an essential foraging habitat for bird species residing on the island.

Measure Description & Collection Protocol

Water quality data is collected by refuge staff and given to the Marine Resources Council as part of the Indian River Lagoonwatch Water Quality Testing Program. This data is collected in cooperation with the Florida Department of Environmental Regulation and is supported by the US EPA. The only data that is reported for this measure is the data that is taken from the data-collection station closest to the Pelican Island Wilderness (Site # IR 3270, at Paul's Island). The annual average salinity is reported in the Wilderness Character Monitoring Database. Depending on the data, an increase or decrease in this value could signify an improving or degrading trend in wilderness character for this indicator (see significant change).

Data Source

Wildlife refuge specialist, biological technician, Marine Resources Council's Indian River Lagoonwatch Water Quality Testing Program. Data can be found online at <http://www.mrcirl.org/water/watch.html> (select the desired year under 'Access Water Quality Maps and Data Online;' report data for site # IR 3270). Data can also be found on the refuge's shared drive in S:\Refuge Complex\Water Quality Monitoring\2013 Data.

Data Adequacy

All water quality data collected at the Paul's Island data collection site (site # IR 3270) are consulted for this measure. Data is accurately collected by refuge staff and reported to the Marine Resources Council.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Significant Change

Because of the ocean inputs to the Indian River Lagoon, the salinity of the lagoon can normally vary between 0 and 35 ppt, with higher salinities at inlets and lower salinities farther from inlets toward freshwater inputs. The Marine Resources Council notes the conditions of waters based readings within the ranges below. Any change to/from one of the following categories would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Salinity (ppt)	Status
≤ 10	Poor
10 - 20	Caution
≥ 20	Good

Detailed Data: Salinity data collected at site IR3270 in 2012	
Date	Salinity (ppt)
January	!
2/15	36.6
3/2	28.2
3/9	30.0
3/23	30.8
4/6	35.6
4/13	35.4
May	!
June	!
7/6	28.0
7/30	31.6
August	!
9/14	28.0
10/3	24.0
November	!
12/19	26.0
Average: 30.38	

Measure 2-10	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2011:	27.85*
2012 Baseline:	30.38**
Baseline Condition:	Good
Data Source:	Biological Technician, Indian River Lagoonwatch Water Quality Testing Program

*2011 Data was only available for September-December

**This data was incomplete because not all data had been entered into the online data archives. Please update this data when it becomes available.

Measure 2-11: Water quality - pH

Background & Context

The Pelican Island Wilderness is located in the Indian River Lagoon, one of the most diverse estuaries in North America. The lagoon was designated an "estuary of national significance" in 1989. Because of the increased human development around the lagoon, the quality of its waters has been unnaturally altered. The pH affects the solubility of minerals in water. Human activities including chemical spills, agricultural runoff, sewage effluent and soil leaching can all affect the pH of the water. Many land-based resources of the Pelican Island Wilderness depend on the quality of the surrounding lagoon waters, which is an essential foraging habitat for bird species residing on the island.

Measure Description & Collection Protocol

Water quality data is collected by refuge staff and given to the Marine Resources Council as part of the Indian River Lagoonwatch Water Quality Testing Program. This data is collected in cooperation with the Florida Department of Environmental Regulation and is supported by the US EPA. The only data that is reported for this measure is the data that is taken from the data-collection station closest to the Pelican Island Wilderness (Site # IR 3270, at Paul's Island). The annual average pH is reported in the Wilderness Character Monitoring Database. Depending on the data, an increase or decrease in this value could signify an improving or degrading trend in wilderness character for this indicator (see significant change).

Data Source

Wildlife refuge specialist, biological technician, Marine Resources Council's Indian River Lagoonwatch Water Quality Testing Program. Data can be found online at <http://www.mrcirl.org/water/watch.html> (select the desired year under 'Access Water Quality Maps and Data Online;' report data for site # IR 3270).

Data Adequacy

All water quality data collected at the Paul's Island data collection site (site # IR 3270) are consulted for this measure. Data is accurately collected by refuge staff and reported to the Marine Resources Council. Data can also be found on the refuge's shared drive in S:\Refuge Complex\Water Quality Monitoring\2013 Data.

Significant Change

The ability of aquatic organisms to survive greatly diminishes as the pH falls below 5 or increases above 9. According to the Marine Resources Council, the pH in freshwater portions of the Indian River Lagoon where the water is not substantially buffered, the pH may sometimes be as low as 6. In the higher salinity areas of the lagoon where the water is buffered because of the influence of sea water, the pH will be higher with values of around 8. The Marine Resources Council notes the conditions of waters based readings within the ranges below. Any change to/from one of the following categories would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

pH	Status
> 8.7	Poor
8.3 - 8.7	Caution
< 8.3	Good

Detailed Data: pH data collected at site IR3270 in 2012	
Date	pH
January	!
2/15	8.5
3/2	8.2
3/9	8.2
3/23	8.1
4/6	8.2
4/13	8.2
May	!
June	!
7/6	8.4
7/30	8.4
August	!
9/14	8.4
10/3	8.4
November	!
12/19	8.4
Average: 8.3	

Measure 2-11	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2011:	8.3*
2012 Baseline:	8.3**
Baseline Condition:	Caution
Data Source:	Biological Technician, Indian River Lagoonwatch Water Quality Testing Program

*2011 Data was only available for September-December

**This data was incomplete because not all data had been entered into the online data archives. Please update this data when it becomes available.

Measure 2-12: Wilderness acreage

Background & Context

The decline in brown pelicans on the island, as noted in *Measure 2-1*, is attributed to the erosion of the rookery island and the general decline of wildlife species in the South Florida Ecosystem. Today, managers focus on limiting disturbance to the rookery and restoring and stabilizing the shoreline from further loss (see *Measure 1-1* and *Measure 1-2*). While erosion is sometimes a natural phenomenon, the erosion of the Pelican Island Wilderness has been predominantly due to the growth of the human population, the associated coastal development, and increases in public use activities including impacts from boat wakes. Climate change induced sea level rise and increased storm events also have potential to increase erosion in the future.

The original 5.5-acre rookery decreased in size from 1943 to 1996 by more than 50 percent to 2.2 acres. With the continual loss of the Pelican Island Wilderness, long-term impacts are experienced by many declining species including decreased populations of nesting birds on the Island such as brown pelicans, wood storks, herons, and egrets. The mangroves which provide prime nesting substrate are also declining.

Measure Description & Collection Protocol

This measure monitors the fluctuation of land acreage as a result of erosion. Wilderness acreage above lagoon waters is reported in the Wilderness Character Monitoring Database for this measure. Over time, a decrease in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

Wildlife refuge specialist, project leader

Data Adequacy

All records for this data are consulted for this measure. Acreage is accurately calculated using either aerial imagery or data from a hired contractor. Therefore the quality of this data is high.

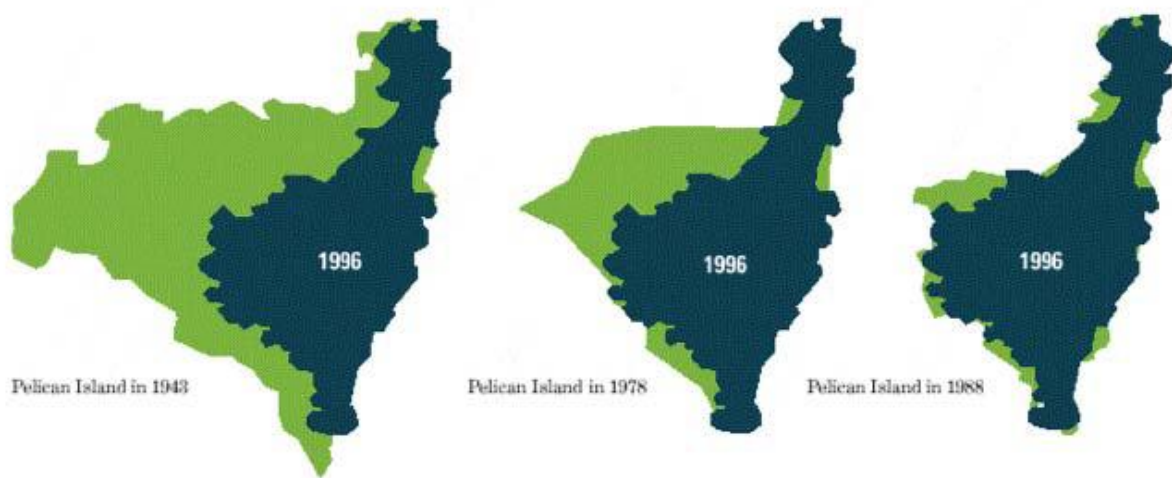
Frequency

Data is entered into the Wilderness Character Monitoring Database as often as data is available with a goal of data collection every five years.




Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.

Measure 2-12	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
1943:	5.5
1996:	2.2
2004:	2.8
2012 Baseline:	3.2
Baseline Condition:	Caution
Data Source:	Comprehensive Conservation Plan (2006); Kristen Kneifl, Wildlife refuge specialist



Comprehensive Conservation Plan (2006)

Undeveloped Quality <i>Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.</i>				
Monitoring Question	Indicator	Measure	Data Adequacy	Weight
What are the trends in non-recreational development and mechanization inside wilderness?	Non-recreational installations, structures, developments	3-1. Count of non-recreational structures, installations, developments		100%
	Inholdings	3-2. Acres of inholdings within the wilderness boundary		100%
	Use of motor vehicles, motorized equipment, and mechanical transport	3-3. Index of administrative (and administratively-approved) mechanical transport and motorized equipment use in wilderness		100%

Measure 3-1: Count of non-recreational structures, installations, developments

Background & Context

There have never been, and likely never will be, developments on the Pelican Island Wilderness. The vulnerability of this measure is very low; however, this measure is highly relevant to the undeveloped quality of wilderness character.

Measure Description & Collection Protocol

This measure tracks trends in the number of structures, installations, or other developments inside the wilderness that are non-recreational. Each wilderness development is counted. The development type and location is noted, but only a count of developments is reported in the Wilderness Character Monitoring Database. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

Project leader, Comprehensive Conservation Plan

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Data Adequacy

All records of non-recreational developments are reported for this measure. A simple count of these developments results in a high degree of accuracy for this measure, and therefore the data quality is high.

Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.

Measure 3-1	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0
Baseline Condition:	Good
Data Source:	Comprehensive Conservation Plan (2006)

Measure 3-2: Acres of inholdings within the wilderness boundary

Background & Context

Since inholdings interior to designated wilderness are not given the same protections as wilderness lands around them, these lands can be developed for various purposes at the discretion of the landowner, and thereby have a large impact on the surrounding wilderness. There are no inholdings within the Pelican Island Wilderness. Because of the island's small size, this possibility is practically unfeasible. While the vulnerability of this measure is very low, this measure is highly relevant to the undeveloped quality of wilderness character.

Measure Description & Collection Protocol

This measure is a reporting of the acreage of inholdings found within the wilderness boundary. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Definitions

- *Inholding* - private or other federal or state agency lands entirely within the wilderness boundary.

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Data Source

Project leader, Comprehensive Conservation Plan

Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.

Data Adequacy

All records of inholdings in wilderness are reported for this measure. This data is common refuge knowledge and therefore the quality of this data is high.

Measure 3-2	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0
Baseline Condition:	Good
Data Source:	Comprehensive Conservation Plan (2006)

Measure 3-3: Index of administrative (and administratively-approved) mechanical transport and motorized equipment use in wilderness

Background & Context

The Wilderness Act discusses three forms of mechanization that degrade wilderness character: motor vehicles (aircraft and motorboats included), motorized equipment, and mechanical transport. Agency policies restrict the use of motor vehicles, motorized equipment, and mechanical transport in wilderness requiring authorizations for such use when deemed necessary. Such equipment and transport is rarely used in the Pelican Island Wilderness; refuge personnel limit their access to the island to only the most extreme cases, and when they do it is usually by non-motorized transport (kayak). If ever such extreme circumstances arise, mechanical transport and motorized equipment will only be used in the Pelican Island Wilderness when such equipment is considered the minimum tool necessary to accomplish refuge goals and to protect the wilderness resource. Helicopters have been used in the past for shoreline stabilization efforts and should be counted in this measure if used in the future. Helicopters are used because the other option – barges – would have been severely degrading to the seagrass beds surrounding the island. But, while helicopters were found to be the least degrading method of delivery for stabilization materials, the birds residing on the Pelican Island Wilderness left the island after all the restoration efforts. It took years for them to return.

Measure Description & Collection Protocol

This single measure directly tracks the status and trends of all motorized and mechanized use that are authorized by the Federal land manager in wilderness. Not all equipment types have the same impact level associated with them. For example, a wheelbarrow has a significantly different impact level than a helicopter has. To account for these differences, an inherent weighting has been assigned to each equipment type based on its perceived impact to social and biophysical resources, as shown in the table below. Mechanized equipment and motorized equipment with a relatively low level of impact are assigned a value of 1, motorized equipment with a moderate level of impact is assigned a value of 2, and motorized equipment with a high level of impact is assigned a 3. A total use level value will be calculated for each motorized/mechanized use by multiplying the inherent weight of each type of equipment by the amount of actual use, as shown in the table below. The resulting products for each motorized/mechanized use are summed to generate a total score for the entire wilderness. This sum is reported in the Wilderness Character Monitoring Database. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

It should be noted that the specific weights are subjectively determined. Best professional judgment should be used when assigning weights. The equipment type list below is not exclusive; if motorized or mechanized tools are used in the wilderness that are not included in this list, they should be weighted and accounted for appropriately.

Equipment Type	Inherent Weight		Amount of Use	Use Weight	Total
Battery-powered tool	1		One piece, 1 day	1	
Wheelbarrow	1		Multiple pieces, 1 day	2	
Chain saw	2		One piece, multiple days	2	
Generator	2		Multiple pieces, multiple days	3	
Helicopter	3				

Data Source

Wildlife refuge specialist, project leader

Data Adequacy

All records of mechanized and motorized use in wilderness are reported for this measure. This data is common refuge knowledge and therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

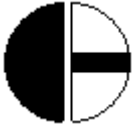




Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.



Helicopter delivering sand to the Pelican Island Wilderness as part of shoreline restoration efforts (FWS)

Measure 3-3	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0
Baseline Condition:	Good
Data Source:	Wildlife refuge specialist

Solitude or Primitive and Unconfined Recreation Quality <i>Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.</i>				
Monitoring Question	Indicator	Measure	Data Adequacy	Weight
What are the trends for outstanding opportunities for solitude within wilderness? What are the trends in outstanding opportunities for primitive and unconfined recreation inside wilderness?	Remoteness from sights and sounds of people inside the wilderness	4-1. Gallons of debris removed from wilderness		100%
	Remoteness from occupied and modified areas outside the wilderness	4-2. Boating speed zone around the wilderness		50%
		4-3. Average percent change in population size of surrounding counties		50%
		Facilities that decrease self-reliant recreation		100%
	Management restrictions on visitor behavior	4-5. Index of restrictions on visitor behavior		100%

Measure 4-1: Staff effort to remove marine debris from wilderness (as measured by gallons removed)

Background & Context

The presence of marine debris on wilderness islands is an impact to the remoteness from sights and sounds of people inside the wilderness. There is no practical way to monitor the amount of debris on the Pelican Island Wilderness, therefore a measure monitoring the effort to remove such debris was created. Trash comes from marine sources, not from wilderness users. This debris is removed when refuge staff visit the island as part of other projects being conducted on the island.

Measure Description & Collection Protocol

This measure monitors the gallons of debris removed from the wilderness island per year. Gallons were chosen as the unit of measure because this can be based on the bag size. Therefore, if different sized bags are used the units will be the same. Over time, an increase in this value would signify an improving trend in wilderness character for this indicator because the refuge staff effort to remove the debris is greater.

Data Source

Wildlife refuge specialist, project leader

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Data Adequacy

All records of debris removal from wilderness are reported for this measure. It is easy for staff to monitor the gallons removed by tracking the number of trash bags. However, there is no way to ensure that an increase in the amount of debris removed doesn't indicate a greater amount of debris on the island (which would actually be a degradation of wilderness character). Therefore the quality of this data is moderate.

Significant Change

Any increase in this data would be a significant enough impact to the wilderness to be interpreted as an improving trend in wilderness character.

Measure 4-1	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0
Baseline Condition:	Poor
Data Source:	Wildlife refuge specialist

Measure 4-2: Boating speed zone around the wilderness

Background & Context

This measure was created in effort to account for the type of boat traffic in transit adjacent to (around) the Pelican Island Wilderness. The lagoon portion of the refuge is being utilized primarily for recreation. The refuge leases these waters of the refuge from the State of Florida. Under the current lease agreement, public uses including traditional navigation, boating, bathing, shell fishing, and commercial and sport fishing are not restricted with the exception of a 410-foot buffer zone surrounding Pelican Island proper (the Pelican Island Wilderness). This buffer zone is measured from the mean high water line.

The Refuge has made a request to Florida Fish and Wildlife Conservation Commission that the rules for the Manatee Management Plan for Indian River County be reviewed and that the ecological and historical importance of the refuge be considered when making decisions about future manatee protection boating speed zones (i.e., zones be created around the Pelican Island Wilderness). Although Indian River County has low figures for manatee mortality (with 27 deaths in 2011 and 7 deaths in 2012), the Refuge is located just south of Brevard County which has the highest manatee mortality figures in the state (with 99 deaths in 2011 and 91 deaths in 2012) (data provided by the Florida Fish and Wildlife Conservation Commission's Marine Mammal Pathobiology Laboratory). The lagoon surrounding the island has been identified as manatee critical habitat. Creating slow speed or idle speeds zones around the island would be beneficial to the manatee as well as the character of the Pelican Island Wilderness. It should be noted that such zones are not always honored, but it does discourage and deter law-abiding citizens from creating motorized disturbance to wildlife. Law enforcement is also an issue, with the refuge employing no law enforcement personnel at this time.

Measure Description & Collection Protocol

This measure monitors the type of boat use adjacent to the Pelican Island Wilderness by scoring the boating speed zone type outside the buffer zone around the island according to the table below. A higher score indicates better protection for the character of the wilderness. Over time, an increase in this value would signify an improving trend in wilderness character for this indicator.

Zone Type	Score
No zoning	0
Slow speed part of the year, unregulated remainder of the year	1
Slow speed all year	2
Idle speed all year	3

Data Source

Wildlife refuge specialist, project leader

Data Adequacy

All records are consulted for this measure. This is common refuge knowledge and state boater knowledge available to the public, therefore the quality of this data is high.

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Significant Change

Any change in this data would be a significant enough impact to the wilderness to be interpreted as an improving or degrading trend in wilderness character.

Measure 4-2	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0
Baseline Condition:	Poor
Data Source:	Comprehensive Conservation Plan (2006)

Measure 4-3: Average percent change in population size of surrounding counties

Background & Context

One of the most degrading impacts to the character of the Pelican Island Wilderness is caused by increased use of waterways surrounding the wilderness island. The change in population of nearby counties is an indicator for use of waterways adjacent to the wilderness. It is assumed that increasing populations will lead to increased watercraft traffic near the wilderness. However, the data that this measure provides is limited because it does not account for use by visitors from non-local locations. These non-resident visitors (i.e. tourists, snowbirds) definitely contribute to the water-based recreation, but there is no practical way to monitor this at this time.

Measure Description & Collection Protocol

At the website listed below, locate data for the average percent change in population for Brevard, Indian River, and St. Lucie.

Web Address: <http://www.census.gov/popest/data/index.html>

Instructions: Click link to "Counties, Total Population, Most Current Data." Then click link to "Annual Population Change" and select "Florida." An Excel document is provided for population data by county for all counties in Florida.

Locate data for the geographic areas of Brevard, Indian River, and St. Lucie counties. Look at the column for percent change. Take the average of the percent change for these three counties; record this average in the Wilderness Character Monitoring Database. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

United States Census Bureau

Frequency

Data is entered into the Wilderness Character Monitoring Database annually.

Data Adequacy

All available records of population change in nearby counties are consulted for this measure. While this data from the Census Bureau is accurate and therefore the quality of the data is high, the quantity of this data is partial because of the limitation of not being able to account for non-resident waterway use.

Significant Change

Any change in this data would be a significant enough impact to the wilderness to be interpreted as a degrading or improving trend in wilderness character.

Detailed Data: Estimates of Resident Population Change for Counties of Florida	
County	Percent Change, 2010 to 2011
Brevard	0
Indian River	0.5
St. Lucie	0.6
Average: 0.36	

Measure 4-3	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0.36*
Baseline Condition:	Caution
Data Source:	US Census Bureau, http://www.census.gov/popest/ data/index.html

*Date of data is change from 2010-2011

Measure 4-4: Number of recreation facilities provided by refuge

Background & Context

Opportunities for primitive and unconfined recreation are most outstanding where visitors must rely on their own skills to navigate and travel and where they have a high degree of freedom over their own actions and decisions. This measure tracks trends in durable or permanent facilities that are used primarily for recreational purposes, regardless of whether these are for resource protection or visitor convenience. There have never been, and likely never will be, recreation facilities on the Pelican Island Wilderness.

Measure Description & Collection Protocol

Structures, installations, and developments that have a recreation purpose or use are monitored under this measure. Each structure is weighted equally. All recreation facilities at a site are counted separately. Any and all facilities are inconsistent with primitive recreation. Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

Project leader, Comprehensive Conservation Plan

Frequency

Data is entered into the Wilderness Character Monitoring Database every five years.

Data Adequacy

All records of all recreation facilities are consulted when determining this data. Since these facilities would be administratively installed, data on these facilities would be very accurate. A simple count of these structures makes for high confidence in the quality of the data.

Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.

Measure 4-4	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	0
Baseline Condition:	Good
Data Source:	Comprehensive Conservation Plan (2006)

Measure 4-5: Index of restrictions on visitor behavior

Background & Context

Opportunities for primitive and unconfin ed recreation are most outstanding where visitors must rely on their own skills to navigate and travel and where they have a high degree of freedom over their own actions and decisions. This measure tracks trends in restrictions that the agency places on visitor behavior inside wilderness. Visitors' opportunities to experience freedom from management are significantly affected by the number and type of regulations in place.

The restrictions on visitor behavior in the Pelican Island Wilderness are in place to protect the natural quality of wilderness character. The Pelican Island Wilderness, as well as the surrounding 410-foot buffer, is closed year-round to the public to protect the variety of colonial nesting birds. For the wilderness 'visitor,' the island provides visual and auditory use and enjoyment. The core mission of the Service's National Wildlife Refuge System is conservation of native fish, wildlife, plants, and their habitats. The Pelican Island Wilderness is closed to visitation to protect wildlife and other natural, cultural, and/or other resources consistent with the conservation purposes of the refuge. Bird colonies residing on the island would be severely adversely affected by public use of the island. Wilderness designation provides an additional level of protection for the wilderness portion of this refuge, but does not open the area to public access or use. Although public use is prohibited within this small wilderness area, wildlife viewing just outside the wilderness boundary is popular.



View of the Pelican Island Wilderness from the refuge's Centennial Trail (FWS)

Measure Description & Collection Protocol

The wilderness is scored on its visitor restrictions according to the table below. This weighted index of restrictions on visitor behavior assigns scores to the type of restriction with more onerous restrictions weighted more heavily. If a wilderness has more than one type of regulation within a given category, the score will be assigned that corresponds to the most restrictive regulation in place. Scores are summed for the entire wilderness to get an overall score of visitor restrictions. This sum is reported in the Wilderness Character Monitoring Database. Over time, a decrease in this value would signify an improving trend in wilderness character for this indicator.

Category	Type of Restriction	Score
Campfires	No restriction	0
	Designated site, setback	1
	Total prohibition	2
Camping	No restriction	0
	Assigned sites, setback	1
	Restricted to certain users	2
	Total prohibition	3
Area Closure	No restriction	0
	Partial closure	1
	Total closure	3

Definitions

- *A score of 0* - indicates no regulation within the category.
- *A score of 1* - indicates some restriction but retention of some individual choice. A score of 1 is also assigned in cases in which regulations are restrictive but affect only one segment of the population (e.g., group size limits generally will not affect most users, and leash laws affect only those with dogs).
- *A score of 2* - indicates that no choice is permitted. For example, assigned site policies that require visitors to select campsites before beginning their trip would receive a score of 2.
- *A score of 3* - is reserved for the most restrictive regulations: use limits and area closures to all use.

Data Source

Project leader, Comprehensive Conservation Plan

Data Adequacy

All records of restrictions on visitor behavior are consulted for this measure. Since this data is common refuge knowledge the quality of this data is high.

Frequency


Data is entered into the Wilderness Character Monitoring Database every five years.

Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.

Visitor Restrictions: Detailed Data		
Category	Type of Restriction	Score
Campfires	Total prohibition	2
Camping	Total prohibition	3
Area Closure	Total closure	3
TOTAL:		8

Measure 4-5	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
2012 Baseline:	8
Baseline Condition:	Caution
Data Source:	Comprehensive Conservation Plan (2006)

Other Features Quality <i>Wilderness may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.</i>				
Monitoring Question	Indicator	Measure	Data Adequacy	Weight
	Loss of cultural/historical resources	5-1. Wilderness acreage		100%

Measure 5-1: Wilderness acreage

Background & Context

Many factors contribute to the cultural, historical, and biological significance of the Pelican Island Wilderness. Pelican Island National Wildlife Refuge's special designations include being the birthplace of the National Wildlife Refuge System (1903), designation as a National Historic Landmark (1963), being added to the list of wetlands of international importance under the Ramsar Convention (1971), and designation as a Marine Protected Area (2009). Erosion is the biggest threat to the character of the Pelican Island Wilderness, and a loss of its terrestrial mass is a loss of what made this island so important. Erosion is not only a loss to the natural quality of wilderness, but also a loss of the cultural/historic resource that is the island.

Measure Description & Collection Protocol

This measure monitors the loss of Pelican Island Refuge. The acreage of the Pelican Island Wilderness above lagoon waters is reported in the Wilderness Character Monitoring Database for this measure. Over time, a decrease in this value would signify a degrading trend in wilderness character for this indicator.

Data Source

Wildlife refuge specialist, project leader

Frequency

Data is entered into the Wilderness Character Monitoring Database as often as data is available with a goal of data collection every five years.

Data Adequacy

All records for this data are consulted for this measure. Acreage is accurately calculated using either aerial imagery or data from a hired contractor. Therefore the quality of this data is high.

Significant Change

Any change in this data would be a significant enough impact to be interpreted as a change in trend of wilderness character.

Measure 5-1	
Wilderness Character Monitoring Database: Reported Data for Pelican Island Wilderness	
1943:	5.5
1996:	2.2
2004:	2.8
2012 Baseline:	3.2
Baseline Condition:	Caution
Data Source:	Comprehensive Conservation Plan (2006); Kristen Kneifl, Wildlife refuge specialist

MEASURES NOT USED FOR WILDERNESS CHARACTER MONITORING

The following measures were considered for inclusion in the wilderness character monitoring strategy, but were ultimately eliminated for one or more reasons. Measures were eliminated based on their reliability, relevance, feasibility, and data availability. The reliability of a measure is the possibility that it can be monitored accurately with a high degree of confidence and would yield the same result if measured by different people at different times. Low feasibility means that data collection would require significant refuge effort beyond current efforts. The 'Prioritizing Potential Measures of Wilderness Character' worksheet (Appendix A) can offer additional insight as to why these measures were eliminated.

Quality - Indicator	Measure	Why not used				Comments
		Low Reliability	Irrelevant	Low Feasibility	No Data	
Natural – Biophysical processes	Coverage of plant / habitat types			X	X	Refuge staff thought this would be useful to monitor, but baseline data does not exist and data collection could have adverse effects on wildlife.
Natural – Physical resources	Oil spill impacts to the wilderness		X			If an oil spill occurs in the Atlantic Ocean and has potential to impact the barrier island that separates the Pelican Island Wilderness from the open ocean, plans are in place to erect booms to prevent the oil slick from entering through the inlet to the Indian River Lagoon. Therefore the vulnerability of this measure is low.
Natural – Physical resources	Water quality – algae blooms				X	At this time, the effects of algae blooms on the character of the Pelican Island Wilderness are unknown. This is something that refuge staff would like to know more about. It is recommended that if data is available on this in the future that it be included in wilderness character monitoring.
Solitude – Remoteness from outside	Aircraft over-flights	X		X	X	Aircraft fly over the Pelican Island Wilderness, although low-level flights are infrequent. Reliability of data is low

Quality - Indicator	Measure	Why not used				Comments
		Low Reliability	Irrelevant	Low Feasibility	No Data	
						because monitoring at different times of the day/year would yield significantly different results.
Solitude – Remoteness from outside	Boat use adjacent to wilderness	X		X	X	Data collection would require refuge effort beyond current efforts. Reliability of data is low because monitoring at different times of the day/year would yield significantly different results. An alternative measure monitoring the boat speed zone around the wilderness attempts to capture the impacts to solitude by motorized boats in transit adjacent to the wilderness.
Solitude – Remoteness from outside	Index of development types visible from wilderness boundary			X	X	Data collection would require refuge effort beyond current efforts. An alternative measure monitoring the population growth of surrounding counties attempts to account for increased development impacts to the wilderness.

CONCLUSIONS

Preserving the historic Pelican Island rookery is a top management priority of the Pelican Island National Wildlife Refuge. The character of the Pelican Island Wilderness is preserved in part by a ‘hands-off’ management approach and complete closure of the island to the public; both preserve the wilderness’s natural and untrammelled qualities. While recreational opportunities within the wilderness are lacking, there are wildland and wildlife observation opportunities from outside the wilderness. Being an island wilderness, the biggest threats to wilderness character in the future will be caused by climate change induced sea level rise which threatens the entire coast of Florida. Climate change and sea level rise have the potential to alter the types and distribution of habitats or could completely inundate the Pelican Island Wilderness. These threats are largely out of refuge management’s control.

Localized impacts to wilderness character are those caused by illegal trespassing into the closed area surrounding the wilderness island. Drifting fishing vessels and recreational kayaks often encroach into this area which disturbs nesting colonial birds. While this is within the scope of refuge management’s control, a lack of law enforcement personnel makes enforcement of this closed area impossible.

The wilderness character monitoring strategy described in this report effectively and completely captures the character of the Pelican Island Wilderness. This thoroughness was accomplished because of the high interest and valued assistance offered by refuge staff.



(FWS)

APPENDICES

Appendix A – Priority ranking of all measures considered

WORKSHEET: PRIORITIZING POTENTIAL MEASURES OF WILDERNESS CHARACTER FOR THE PELICAN ISLAND WILDERNESS

Directions: In each row, write the potential measure in the left column under the appropriate indicator. Add or delete rows as needed. Use the criteria and ranking guide below to create an overall score for each measure. If the combined score for criteria A and B is ≤ 2 , STOP and do not score criteria C and D. Those measures with the highest overall scores should be the highest priority for assessing trends in wilderness character.

A. Level of significance (the measure is highly relevant to the quality and indicator of wilderness character, and is highly useful for managing the wilderness):

High = 3 points, Medium = 2 points, Low = 1 point

B. Level of vulnerability (measures an attribute of wilderness character that currently is at risk, or might likely be at risk over 10-15 years): High = 3 points, Medium = 2 points, Low = 1 point

C. Degree of reliability (the measure can be monitored accurately with a high degree of confidence, and would yield the same result if measured by different people at different times):

High = 3 points, Medium = 2 points, Low = 1 point

D. Degree of feasibility (the measure is related to an existing effort or could be monitored without significant additional effort):

High = 1 point, Low = 0 point (if 0 is given, do not use)

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
UNTRAMMELED QUALITY						
Indicator: Authorized actions that manipulate the biophysical environment Measure: Amount of vegetation planted on/around the island	3	3	3	1	10	
Indicator: Authorized actions that manipulate the biophysical environment Measure: Amount of shell (or other hard material) placed on/around the island	3	3	3	1	10	

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Authorized actions that manipulate the biophysical environment Measure: Index of other trammeling management actions	3	2	3	1	9	(B) Lower because management actions on island are rare.
Indicator: Unauthorized actions that manipulate the biophysical environment Measure: Index of unauthorized actions that intentionally manipulate the biophysical environment	3	2	1	1	7	(B) Lower because wilderness and surrounding area is closed to all visitors. (C) Low because absence of LEO.
NATURAL QUALITY						
Indicator: Plant and animal species and communities Measure: Brown pelican data	3	3	3	1	10	(B) High because erosion threatens habitat.
Indicator: Plant and animal species and communities Measure: Wood stork data	3	3	3	1	10	(B) High because erosion threatens habitat.
Indicator: Plant and animal species and communities Measure: Index of threats posed by non-native plant species in wilderness	3	2	3	1	9	(B) Lower because of isolation of island.
Indicator: Plant and animal species and communities Measure: Index of threats posed by non-native animal species in wilderness	3	2	3	1	9	(B) Lower because of isolation of island.
Indicator: Physical resources Measure: Air quality: Ozone air pollution	3	2	3	1	9	Not sure about vulnerability of AQ?
Indicator: Physical resources Measure: Air quality: Total nitrogen wet deposition	3	2	3	1	9	
Indicator: Physical resources Measure: Air quality: Total sulfur wet deposition	3	2	3	1	9	
Indicator: Physical resources Measure: Air quality: Visibility	3	2	3	1	9	
Indicator: Physical resources Measure: Water quality: dissolved oxygen	3	3	3	1	10	

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Physical resources Measure: Water quality: salinity	3	3	3	1	10	
Indicator: Physical resources Measure: Water quality: pH	3	3	3	1	10	
Indicator: Physical resources Measure: Oil spill impacts to the wilderness	3	1	2	1	7	
Indicator: Biophysical processes Measure: Wilderness acreage	3	3	3	1	10	
Indicator: Biophysical processes Measure: Coverage of plant types	3	3	1	0	7	
UNDEVELOPED QUALITY						
Indicator: Non-recreational structures, installations, or developments Measure: Count of non-recreational structures, installations, developments	3	1	3	1	8	(B) No developments will ever be constructed on the Pelican Island Wilderness.
Indicator: Inholdings Measure: Acres of inholdings within the wilderness boundary	3	1	3	1	8	(B) No inholdings will ever be established on the Pelican Island Wilderness.
Indicator: Use of motor vehicles, motorized equipment, or mechanical transport Measure: Index of administrative (and administratively-approved) mechanical transport and motorized equipment use in wilderness	3	2	3	1	9	(B) Only vulnerability is helicopters that might be used for future island stabilization efforts.
SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION QUALITY						
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Gallons of debris removed from wilderness	3	3	3	1	10	(B) High because marine debris can wash onto the island anytime. Storms have potential to increase this vulnerability.

POTENTIAL MEASURE	Criteria for Prioritizing Potential Measures				OVERALL SCORE	Comments
	A. Significance	B. Vulnerability	C. Reliability	D. Feasibility		
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Boating speed zone around the wilderness	3	3	3	1	10	
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Average percent change in population size of surrounding counties	3	3	3	1	10	
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Index of development types adjacent to wilderness boundary	3	3	3	0	9	(C) High because development pressures are outside the refuge's control.
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Boat use adjacent to wilderness	2	3	1	0	6	
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Aircraft over-flights	2	3	1	0	6	
Indicator: Facilities that decrease self-reliant recreation Measure: Number of recreation facilities provided by refuge	3	1	3	1	8	(B) No recreation facilities will ever be installed on the Pelican Island Wilderness.
Indicator: Management restrictions on visitor behavior Measure: Index of restrictions on visitor behavior	3	1	3	1	8	(B) Visitors will likely always be restricted from the island as they are at present.
Other Features Quality (if applicable)						
Indicator: Loss of cultural resources Measure: Wilderness acreage	3	3	3	1	10	

Appendix B – Summary of effort required for wilderness character monitoring

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
Untrammeled	Authorized actions	1-1. Amount of vegetation planted on/around the island	paper files	1	Refuge restoration files (permitting docs, monitoring docs) S:\Refuge Complex\Pelican Island NWR\Restoration Projects\Pelican Island Proper
Untrammeled	Authorized actions	1-2. Cubic feet of shell, sand, or other hard material placed on/around the island	refuge electronic files	1	Refuge restoration files (permitting docs, monitoring docs) S:\Refuge Complex\Pelican Island NWR\Restoration Projects\Pelican Island Proper
Untrammeled	Authorized actions	1-3. Index of other trammeling management actions	common refuge knowledge	1	This information is common refuge knowledge. If the island was visited within the last year and management actions were taken, this would be common refuge knowledge because such visitations are rare.
Untrammeled	Unauthorized actions	1-4. Index of unauthorized actions that intentionally manipulate the biophysical environment	professional judgment	1	Formal files of such incidents are not kept. If legal action is taken, law enforcement files would be created.
Natural	Plant and animal species	2-1. Brown pelican flight count (highest for the year)	refuge electronic files	1	S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets\Bird Survey Protocol Datasheets\Flight Line Count Survey (Document is named "Cumulative Data")

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
Natural	Plant and animal species	2-2. Wood stork flight count (highest for the year)	refuge electronic files	1	S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets\Bird Survey Protocol Datasheets\Flight Line Count Survey (Document is named "Cumulative Data")
Natural	Plant and animal species	2-3. Index of non-native plant species in wilderness	common refuge knowledge	1	
Natural	Plant and animal species	2-4. Index of non-native animal species in wilderness	common refuge knowledge	1	
Natural	Physical resources	2-5, 2-6, 2-7, 2-8. Air quality measures: (1) ozone, (2) nitrogen wet deposition, (3) sulfur wet deposition, (4) visibility.	Inventory & Monitoring Reports	1	Data is collected by I&M staff (not refuge staff) and is supplied by this department to the refuge.
Natural	Physical resources	2-9, 2-10, 2-11. Water quality measures: (1) dissolved oxygen, (2) salinity, (3) pH.	refuge paper files, online data	1	Paper files can be found in wildlife refuge specialist's files. http://www.mrcirl.org/water/watch.html
Natural	Biophysical processes	2-12. Wilderness acreage	common refuge knowledge, refuge paper files	1	Comprehensive Conservation Plan

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
Undeveloped	Non-recreational structures, installations, and developments	3-1. Count of non-recreational structures, installations, developments	common refuge knowledge, refuge paper files	1	Comprehensive Conservation Plan
Undeveloped	Inholdings	3-2. Acres of inholdings within the wilderness boundary	common refuge knowledge	1	
Undeveloped	Use of motorized or mechanical	3-3. Index of administrative (and administratively-approved) mechanical transport and motorized equipment use in wilderness	common refuge knowledge	1	This information is common refuge knowledge. If the island was visited within the last year and motorized transport or mechanical equipment was used , this would be common refuge knowledge because such uses are rare.
Solitude +	Remoteness from inside	4-1. Gallons of debris removed from wilderness	TBD	1	Gallons have typically not been kept track of in the past, but will be kept track of in the future. If the gallons are recorded in a specific location (on the shared drive, in refuge paper files), this location should be documented here. Data will likely be kept by the wildlife refuge specialist or will be common refuge knowledge.
Solitude +	Remoteness from outside	4-2. Boating speed zone around the wilderness	common refuge knowledge, refuge paper	1	Comprehensive Conservation Plan

Quality	Indicator	Measure	Type of Data Source	Time spent gathering data for each measure (in whole hours)	Comments
			files		
Solitude +	Remoteness from outside	4-3. Average percent change in population size of surrounding counties	Census Bureau website	1	US Census Bureau, http://www.census.gov/popest/data/index.html
Solitude +	Facilities that decrease self-reliant recreation	4-4. Number of recreation facilities provided by refuge	common refuge knowledge, refuge paper files	1	Comprehensive Conservation Plan
Solitude +	Mgmt restrictions on visitor behavior	4-5. Index of restrictions on visitor behavior	common refuge knowledge, refuge paper files	1	Comprehensive Conservation Plan
Other Features	Loss of cultural resources	5-1. Wilderness acreage	common refuge knowledge, refuge paper files	1	Comprehensive Conservation Plan

Appendix C – Data sources and protocols for all measures used

Keeping Track of Wilderness Character Monitoring Measures

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
Untrammelled Quality		
1-1. Amount of vegetation planted on/around the island	H	<p><i>Source:</i> Refuge restoration files; permitting docs, monitoring docs. [S:\Refuge Complex\Pelican Island NWR\Restoration Projects\Pelican Island Proper]. Refuge knowledge.</p> <p><i>Protocol:</i> Inquiry to refuge staff; reading relevant documents (CCP, permitting docs, monitoring docs). Includes the number of seeds and seedlings planted. This data is required as part of the permitting process for stabilization projects.</p>
1-2. Cubic feet of shell, sand, or other hard material placed on/around the island	H	<p><i>Source:</i> Refuge restoration files; permitting docs, monitoring docs. [S:\Refuge Complex\Pelican Island NWR\Restoration Projects\Pelican Island Proper]. Refuge knowledge.</p> <p><i>Protocol:</i> Inquiry to refuge staff; reading relevant documents (CCP, permitting docs, monitoring docs). Amount, in cubic feet, of shell (loose or bagged) or other hard material (i.e. sand) placed on or around the Pelican Island wilderness as part of efforts to stabilize the island's shoreline. This data is required as part of the permitting process for stabilization projects.</p>
1-3. Index of other trammeling management actions	M	<p><i>Source:</i> Refuge knowledge, Comprehensive Conservation Plan.</p> <p><i>Protocol:</i> Inquiry to refuge staff. Accounts for all other authorized trammeling actions that are not monitored by other measures. Each trammeling action is scored according to whether a Minimum Requirements Analysis (MRA) was completed for the action, the extent that the activity affects the community of life (spatial extent and species affected), and the temporal extent of the activity. The sum of these scores generates a total score for each trammeling action; the summed score for all trammeling activities is reported in Wilderness Character Monitoring Database.</p>
1-4. Index of unauthorized actions that intentionally manipulate the biophysical environment	M	<p><i>Source:</i> Refuge knowledge, Comprehensive Conservation Plan, law enforcement files.</p> <p><i>Protocol:</i> Inquiry to refuge staff. Accounts for any unauthorized intentional manipulations in the Pelican Island Wilderness. Each such trammeling is scored according to the extent that the activity affects the community of life (spatial extent and species affected) and the temporal extent of the activity. The sum of these scores generates a total score for</p>

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		each trammeling action; the summed score for all trammeling activities is reported in Wilderness Character Monitoring Database.
Natural Quality		
2-1. Brown pelican flight count (highest for the year)	H	<p><i>Source:</i> Wildlife refuge specialist, refuge biology files. [S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets\Bird Survey Protocol Datasheets]</p> <p><i>Protocol:</i> Flight-line counts are conducted twice a month throughout the year. To conduct a flight-line count, observers count all birds flying to and from the colony from all directions over a specified period of time. This method provides an estimate of the number of nesting pairs in a colony by measuring the flight rate of adults leaving and entering. Protocol can be found at S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets (Document is named "Pelican Island NWR Bird Survey Protocol 2012.pdf). The highest total flight line count (north side plus south side) for the brown pelican during the year of interest is recorded in the Wilderness Character Monitoring Database.</p>
2-2. Wood stork flight count (highest for the year)	H	<p><i>Source:</i> Wildlife refuge specialist, refuge biology files. [S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets\Bird Survey Protocol Datasheets]</p> <p><i>Protocol:</i> Flight-line counts are conducted twice a month throughout the year. To conduct a flight-line count, observers count all birds flying to and from the colony from all directions over a specified period of time. This method provides an estimate of the number of nesting pairs in a colony by measuring the flight rate of adults leaving and entering. Protocol can be found at S:\Refuge Complex\Pelican Island NWR\Birds\PINWR protocols and datasheets (Document is named "Pelican Island NWR Bird Survey Protocol 2012.pdf). The highest total flight line count (north side plus south side) for the brown pelican during the year of interest is recorded in the Wilderness Character Monitoring Database.</p>
2-3. Index of non-native plant species in wilderness	M	<p><i>Source:</i> Refuge knowledge, wildlife refuge specialist.</p> <p><i>Protocol:</i> Provides data on the number of invasive species in wilderness and scores each species based on the threat it poses to wilderness character. A threat level score posed by each non-native plant species found in wilderness is assigned. Threats considered include those posed to the critical habitat and/or food sources of sensitive and/or rare species; terrestrial,</p>

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		aquatic, and atmospheric natural resources and processes; etc. The score for each species is summed and reported in the Wilderness Character Monitoring Database.
2-4. Index of non-native animal species in wilderness	M	<p><i>Source:</i> Refuge knowledge, wildlife refuge specialist.</p> <p><i>Protocol:</i> Provides data on the number of invasive species in wilderness and scores each species based on the threat it poses to wilderness character. A threat level score posed by each non-native plant species found in wilderness is assigned. Threats considered include those posed to the critical habitat and/or food sources of sensitive and/or rare species; terrestrial, aquatic, and atmospheric natural resources and processes; etc. The score for each species is summed and reported in the Wilderness Character Monitoring Database.</p>
2-5. Air quality: Ozone air pollution	M	<p><i>Source:</i> National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.</p> <p><i>Protocol:</i> Fourth highest 8-hour average ozone concentration in parts per billion (ppb). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages.</p>
2-6. Air quality: Total nitrogen wet deposition	M	<p><i>Source:</i> National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.</p> <p><i>Protocol:</i> Concentration of nitrogen in atmospheric wet deposition (i.e. rain, snow), in units kilogram per hectare (kg/ha). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages.</p>
2-7. Air quality: Total sulfur wet deposition	M	<p><i>Source:</i> National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.</p> <p><i>Protocol:</i> Concentration of sulfur in atmospheric wet deposition (i.e. rain, snow), in units kilogram per hectare (kg/ha). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as five-year averages.</p>
2-8. Air quality: Visibility	M	<p><i>Source:</i> National Wildlife Refuge System's Natural Resource Program Center, Inventory and Monitoring Department.</p> <p><i>Protocol:</i> Scenic conditions that determine how well and how far a wilderness visitor can see based on the amount of small particles in the air, in units deciview (Dv). Over time, an increase in this value would signify a degrading trend in wilderness character for this indicator. Values are reported as</p>

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		five-year averages.
2-9. Water quality: dissolved oxygen	H	<p><i>Source:</i> Wildlife refuge specialist, biological technician, Marine Resources Council's Indian River Lagoonwatch Water Quality Testing Program. Data can be found online at http://www.mrcirl.org/water/watch.html (select the desired year under 'Access Water Quality Maps and Data Online;' report data for site # IR 3270). Data can also be found on the refuge's shared drive in S:\Refuge Complex\Water Quality Monitoring\2013 Data.</p> <p><i>Protocol:</i> Water quality data is collected by refuge staff and given to the Marine Resources Council as part of the Indian River Lagoonwatch Water Quality Testing Program. This data is collected in cooperation with the Florida Department of Environmental Regulation and is supported by the US EPA. The only data that is reported for this measure is the data that is taken from the data-collection station closest to the Pelican Island Wilderness (Site # IR 3270, at Paul's Island). The annual average dissolved oxygen is reported in the Wilderness Character Monitoring Database. Depending on the data, an increase or decrease in this value could signify an improving or degrading trend in wilderness character for this indicator (see significant change).</p>
2-10. Water quality: salinity	H	<p><i>Source:</i> Wildlife refuge specialist, biological technician, Marine Resources Council's Indian River Lagoonwatch Water Quality Testing Program. Data can be found online at http://www.mrcirl.org/water/watch.html (select the desired year under 'Access Water Quality Maps and Data Online;' report data for site # IR 3270). Data can also be found on the refuge's shared drive in S:\Refuge Complex\Water Quality Monitoring\2013 Data.</p> <p><i>Protocol:</i> Water quality data is collected by refuge staff and given to the Marine Resources Council as part of the Indian River Lagoonwatch Water Quality Testing Program. This data is collected in cooperation with the Florida Department of Environmental Regulation and is supported by the US EPA. The only data that is reported for this measure is the data that is taken from the data-collection station closest to the Pelican Island Wilderness (Site # IR 3270, at Paul's Island). The annual average dissolved oxygen is reported in the Wilderness Character Monitoring Database. Depending on the data, an increase or decrease in this value could signify an improving or degrading trend in wilderness character for this indicator (see significant change).</p>

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
2-11. Water quality: pH	H	<p><i>Source:</i> Wildlife refuge specialist, biological technician, Marine Resources Council's Indian River Lagoonwatch Water Quality Testing Program. Data can be found online at http://www.mrcirl.org/water/watch.html (select the desired year under 'Access Water Quality Maps and Data Online;' report data for site # IR 3270). Data can also be found on the refuge's shared drive in S:\Refuge Complex\Water Quality Monitoring\2013 Data.</p> <p><i>Protocol:</i> Water quality data is collected by refuge staff and given to the Marine Resources Council as part of the Indian River Lagoonwatch Water Quality Testing Program. This data is collected in cooperation with the Florida Department of Environmental Regulation and is supported by the US EPA. The only data that is reported for this measure is the data that is taken from the data-collection station closest to the Pelican Island Wilderness (Site # IR 3270, at Paul's Island). The annual average dissolved oxygen is reported in the Wilderness Character Monitoring Database. Depending on the data, an increase or decrease in this value could signify an improving or degrading trend in wilderness character for this indicator (see significant change).</p>
2-12. Wilderness acreage	H	<p><i>Source:</i> Refuge knowledge, wildlife refuge specialist, project leader.</p> <p><i>Protocol:</i> Monitors the fluctuation of land acreage as a result of erosion. Wilderness acreage above lagoon waters is reported in the Wilderness Character Monitoring Database for this measure.</p>
Undeveloped Quality		
3-1. Count of non-recreational structures, installations, developments	M	<p><i>Source:</i> Project leader, Comprehensive Conservation Plan</p> <p><i>Protocol:</i> Tracks trends in the number of structures, installations, or other developments inside the wilderness that are non-recreational. Each wilderness development is counted. The development type and location is noted, but only a count of developments is reported in the Wilderness Character Monitoring Database.</p>
3-2. Acres of inholdings within the wilderness boundary	M	<p><i>Source:</i> Project leader, Comprehensive Conservation Plan</p> <p><i>Protocol:</i> A reporting of the acreage of inholdings found within the wilderness boundary.</p>
3-3. Index of administrative (and	M	<p><i>Source:</i> Refuge knowledge, project leader.</p>

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
administratively-approved) mechanical transport and motorized equipment use in wilderness		<i>Protocol:</i> tracks the status and trends of all motorized and mechanized use that are authorized by the Federal land manager in wilderness. Not all equipment types have the same impact level associated with them. For example, a wheelbarrow has a significantly different impact level than a helicopter has. To account for these differences, an inherent weighting has been assigned to each equipment type based on its perceived impact to social and biophysical resources, as shown in the table below. Mechanized equipment and motorized equipment with a relatively low level of impact are assigned a value of 1, motorized equipment with a moderate level of impact is assigned a value of 2, and motorized equipment with a high level of impact is assigned a 3. A total use level value will be calculated for each motorized/mechanized use by multiplying the inherent weight of each type of equipment by the amount of actual use, as shown in the table below. The resulting products for each motorized/mechanized use are summed to generate a total score for the entire wilderness. This sum is reported in the Wilderness Character Monitoring Database.
Solitude or Primitive and Unconfined Quality		
4-1. Gallons of debris removed from wilderness	M	<i>Source:</i> Wildlife refuge specialist, project leader <i>Protocol:</i> This measure monitors the gallons of debris removed from the wilderness island per year. Gallons were chosen as the unit of measure because this can be based on the bag size. Therefore, if different sized bags are used the units will be the same.
4-2. Boating speed zone around the wilderness	M	<i>Source:</i> Refuge knowledge, Comprehensive Conservation Plan <i>Protocol:</i> This measure monitors the type of boat use adjacent to the Pelican Island Wilderness by scoring the boating speed zone type outside the buffer zone around the island.
4-3. Average percent change in population size of surrounding counties	M	<i>Source:</i> United States Census Bureau <i>Protocol:</i> At the website listed below, locate data for the average percent change in population for Brevard, Indian River, and St. Lucie. Web Address - http://www.census.gov/popest/data/index.html Instructions - Click link to "Counties, Total Population, Most Current Data." Then click link to "Annual Population Change" and select "Florida." An Excel document is provided for population data by county for all counties in Florida. Locate data for the geographic areas of Brevard, Indian River, and St.

Measure	Priority (H, M, L)	Detailed Description of the Data Source(s) and Protocols for How the Data Were Gathered
		Lucie counties. Look at the column for percent change. Take the average of the percent change for these three counties; record this average in the Wilderness Character Monitoring Database.
4-4. Number of recreation facilities provided by refuge	M	<p><i>Source:</i> Project leader, Comprehensive Conservation Plan</p> <p><i>Protocol:</i> Structures, installations, and developments that have a recreation purpose or use are monitored under this measure. Each structure is weighted equally. All recreation facilities at a site are counted separately. Any and all facilities are inconsistent with primitive recreation.</p>
4-5. Index of restrictions on visitor behavior	M	<p><i>Source:</i> Refuge knowledge, Comprehensive Conservation Plan</p> <p><i>Protocol:</i> The wilderness is scored on its visitor restrictions. This weighted index of restrictions on visitor behavior assigns scores to the type of restriction with more onerous restrictions weighted more heavily. If a wilderness has more than one type of regulation within a given category, the score will be assigned that corresponds to the most restrictive regulation in place. Scores are summed for the entire wilderness to get an overall score of visitor restrictions. This sum is reported in the Wilderness Character Monitoring Database.</p>
Other Features		
5-1. Wilderness acreage	H	<p><i>Source:</i> Refuge knowledge, wildlife refuge specialist, project leader.</p> <p><i>Protocol:</i> Monitors the fluctuation of land acreage as a result of erosion. Wilderness acreage above lagoon waters is reported in the Wilderness Character Monitoring Database for this measure.</p>

Appendix D – The 1964 Wilderness Act

WILDERNESS ACT

Public Law 88-577 (16 U.S.C. 1131-1136)
88th Congress, Second Session
September 3, 1964

AN ACT

To establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

Short Title

Section 1. This Act may be cited as the "Wilderness Act."

WILDERNESS SYSTEM ESTABLISHED STATEMENT OF POLICY

Section 2.(a) In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas", and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent Act.

(b) The inclusion of an area in the National Wilderness Preservation System notwithstanding, the area shall continue to be managed by the Department and agency having jurisdiction thereover immediately before its inclusion in the National Wilderness Preservation System unless otherwise provided by Act of Congress. No appropriation shall be available for the payment of expenses or salaries for the administration of the National Wilderness Preservation System as a separate unit nor shall any appropriations be available for additional personnel stated as being required solely for the purpose of managing or administering areas solely because they are included within the National Wilderness Preservation System.

DEFINITION OF WILDERNESS

(c) A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

NATIONAL WILDERNESS PRESERVATION SYSTEM - EXTENT OF SYSTEM

Section 3.(a) All areas within the national forests classified at least 30 days before September 3, 1964 by the Secretary of Agriculture or the Chief of the Forest Service as "wilderness", "wild", or "canoe" are hereby designated as wilderness areas. The Secretary of Agriculture shall -

(1) Within one year after September 3, 1964, file a map and legal description of each wilderness area with the Interior and Insular Affairs Committees of the United States Senate and the House of Representatives, and such descriptions shall have the same force and effect as if included in this Act: Provided, however, That correction of clerical and typographical errors in such legal descriptions and maps may be made.

(2) Maintain, available to the public, records pertaining to said wilderness areas, including maps and legal descriptions, copies of regulations governing them, copies of public notices of, and reports submitted to Congress regarding pending additions, eliminations, or modifications. Maps, legal descriptions, and regulations pertaining to wilderness areas within their respective jurisdictions also shall be available to the public in the offices of regional foresters, national forest supervisors, and forest rangers.

Classification. (b) The Secretary of Agriculture shall, within ten years after September 3, 1964, review, as to its suitability or unsuitability for preservation as wilderness, each area in the national forests classified on September 3, 1964 by the Secretary of Agriculture or the Chief of the Forest Service as "primitive" and report his findings to the President.

Presidential recommendation to Congress. The President shall advise the United States Senate and House of Representatives of his recommendations with respect to the designation as "wilderness" or other reclassification of each area on which review has been completed, together with maps and a definition of boundaries. Such advice shall be given with respect to not less than one-third of all the areas now classified as "primitive" within three years after September 3, 1964, not less than two-thirds within seven years after September 3, 1964, and the remaining areas within ten years after September 3, 1964.

Congressional approval. Each recommendation of the President for designation as "wilderness" shall become effective only if so provided by an Act of Congress. Areas classified as "primitive" on September 3, 1964 shall continue to be administered under the rules and regulations affecting such areas on September 3, 1964 until Congress has determined otherwise. Any such area may be increased in size by the President at the time he submits his recommendations to the Congress by not more than five thousand acres with no more than one thousand two hundred and eighty acres of such increase in any one compact unit; if it is proposed to increase the size of any such area by more than five thousand acres or by more than one thousand two hundred and eighty acres in any one compact unit the increase in size shall not become effective until acted upon by Congress. Nothing herein contained shall limit the President in proposing, as part of his recommendations to Congress, the alteration of existing boundaries of primitive areas or recommending the addition of any contiguous area of national forest lands predominantly of wilderness value. Notwithstanding any other provisions of this Act, the Secretary of Agriculture may complete his review and delete such area as may be necessary, but not to exceed seven thousand acres, from the southern tip of the Gore Range-Eagles Nest Primitive Area, Colorado, if the Secretary determines that such action is in the public interest.

Report to President. (c) Within ten years after September 3, 1964 the Secretary of the Interior shall review every roadless area of five thousand contiguous acres or more in the national parks, monuments and other units of the national park system and every such area of, and every roadless island within the national wildlife refuges and game ranges, under his jurisdiction on September 3, 1964 and shall report to the President his recommendation as to the suitability or unsuitability of each such area or island for preservation as wilderness.

Presidential recommendation to Congress. The President shall advise the President of the Senate and the Speaker of the House of Representatives of his recommendation with respect to the designation as wilderness of each such area or island on which review has been completed, together with a map thereof and a definition of its boundaries. Such advice shall be given with respect to not less than one-third of the areas and islands to be reviewed under this subsection within three years after September 3, 1964, not less than two-thirds within seven years of September 3, 1964 and the remainder within ten years of September 3, 1964.

Congressional approval. A recommendation of the President for designation as wilderness shall become effective only if so provided by an Act of Congress. Nothing contained herein shall, by implication or otherwise, be construed to lessen the present statutory authority of the

Secretary of the Interior with respect to the maintenance of roadless areas within units of the national park system.

Suitability. (d)(1) The Secretary of Agriculture and the Secretary of the Interior shall, prior to submitting any recommendations to the President with respect to the suitability of any area for preservation as wilderness -

Publication in Federal Register. (A) give such public notice of the proposed action as they deem appropriate, including publication in the Federal Register and in a newspaper having general circulation in the area or areas in the vicinity of the affected land;

Hearings. (B) hold a public hearing or hearings at a location or locations convenient to the area affected. The hearings shall be announced through such means as the respective Secretaries involved deem appropriate, including notices in the Federal Register and in newspapers of general circulation in the area: Provided, That if the lands involved are located in more than one State, at least one hearing shall be held in each State in which a portion of the land lies;

(C) at least thirty days before the date of a hearing advise the Governor of each State and the governing board of each county, or in Alaska the borough, in which the lands are located, and Federal departments and agencies concerned, and invite such officials and Federal agencies to submit their views on the proposed action at the hearing or by no later than thirty days following the date of the hearing.

Any views submitted to the appropriate Secretary under the provisions of (1) of this subsection with respect to any area shall be included with any recommendations to the President and to Congress with respect to such area.

Proposed modification. (e) Any modification or adjustment of boundaries of any wilderness area shall be recommended by the appropriate Secretary after public notice of such proposal and public hearing or hearings as provided in subsection (d) of this section. The proposed modification or adjustment shall then be recommended with map and description thereof to the President. The President shall advise the United States Senate and the House of Representatives of his recommendations with respect to such modification or adjustment and such recommendations shall become effective only in the same manner as provided for in subsections (b) and (c) of this section.

USE OF WILDERNESS AREAS

Section 4.(a) The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and national wildlife refuge systems are established and administered and -

(1) Nothing in this Act shall be deemed to be in interference with the purpose for which national forests are established as set forth in the Act of June 4, 1897 (30 Stat. 11), and the Multiple-Use Sustained-Yield Act of June 12, 1960 (74 Stat. 215) (16 U.S.C. 528-531).

(2) Nothing in this Act shall modify the restrictions and provisions of the Shipstead-Nolan Act (Public Law 539, Seventy-first Congress, July 10, 1930; 46 Stat. 1020), the Thye-Blatnik Act (Public Law 733, Eightieth Congress, June 22, 1948; 62 Stat. 568), and the Humphrey-Thye-Blatnik-Andresen Act (Public Law 607, Eighty-Fourth Congress, June 22, 1956; 70 Stat. 326), as applying to the Superior National Forest or the regulations of the Secretary of Agriculture.

(3) Nothing in this Act shall modify the statutory authority under which units of the national park system are created. Further, the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with sections 1, 2, 3, and 4 of this title, the statutory authority under which the area was created, or any other Act of Congress which might pertain to or affect such area, including, but not limited to, the Act of June 8, 1906 (34 Stat. 225; 16 U.S.C. 432 et seq.); section 3(2) of the Federal Power Act (16 U.S.C. 796(2)); and the Act of August 21, 1935 (49 Stat. 666; 16 U.S.C. 461 et seq.).

(b) Except as otherwise provided in this Act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this

Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

PROHIBITION OF CERTAIN USES

(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

SPECIAL PROVISIONS

(d) The following special provisions are hereby made:

(1) Within wilderness areas designated by this Act the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue subject to such restrictions as the Secretary of Agriculture deems desirable. In addition, such measures may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable.

(2) Nothing in this Act shall prevent within national forest wilderness areas any activity, including prospecting, for the purpose of gathering information about mineral or other resources, if such activity is carried on in a manner compatible with the preservation of the wilderness environment. Furthermore, in accordance with such program as the Secretary of the Interior shall develop and conduct in consultation with the Secretary of Agriculture, such areas shall be surveyed on a planned, recurring basis consistent with the concept of wilderness preservation by the United States Geological Survey and the United States Bureau of Mines to determine the mineral values, if any, that may be present; and the results of such surveys shall be made available to the public and submitted to the President and Congress.

Mineral leases, claims, etc. (3) Notwithstanding any other provisions of this Act, until midnight December 31, 1983, the United States mining laws and all laws pertaining to mineral leasing shall, to the extent as applicable prior to September 3, 1964, extend to those national forest lands designated by this Act as "wilderness areas"; subject, however, to such reasonable regulations governing ingress and egress as may be prescribed by the Secretary of Agriculture consistent with the use of the land for mineral location and development and exploration, drilling, and production, and use of land for transmission lines, waterlines, telephone lines, or facilities necessary in exploring, drilling, producing, mining, and processing operations, including where essential the use of mechanized ground or air equipment and restoration as near as practicable of the surface of the land disturbed in performing prospecting, location, and , in oil and gas leasing, discovery work, exploration, drilling, and production, as soon as they have served their purpose. Mining locations lying within the boundaries of said wilderness areas shall be held and used solely for mining or processing operations and uses reasonably incident thereto; and hereafter, subject to valid existing rights, all patents issued under the mining laws of the United States affecting national forest lands designated by this Act as wilderness areas shall convey title to the mineral deposits within the claim, together with the right to cut and use so much of the mature timber therefrom as may be needed in the extraction, removal, and beneficiation of the mineral deposits, if needed timber is not otherwise reasonably available, and if the timber is cut under sound principles of forest management as defined by the national forest rules and regulations, but each such patent shall reserve to the United States all title in or to the surface of the lands and products thereof, and no use of the surface of the claim or the resources therefrom not reasonably required for carrying on mining or prospecting shall be allowed except as otherwise expressly provided in this Act: Provided, That, unless hereafter specifically authorized, no patent within wilderness areas designated by this Act shall issue after December 31, 1983, except for the valid claims existing on or before December 31, 1983. Mining claims located after September 3, 1964, within the boundaries of wilderness areas designated by this Act shall create no rights in excess of those rights which may be patented under the provisions of this subsection. Mineral leases, permits, and licenses covering lands within national forest wilderness areas designated by this Act shall contain such reasonable stipulations as may

be prescribed by the Secretary of Agriculture for the protection of the wilderness character of the land consistent with the use of the land for the purposes for which they are leased, permitted, or licensed. Subject to valid rights then existing, effective January 1, 1984, the minerals in lands designated by this Act as wilderness areas are withdrawn from all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral leasing and all amendments thereto.

Water resources and grazing. (4) Within wilderness areas in the national forests designated by this Act, **(1)** the President may, within a specific area and in accordance with such regulations as he may deem desirable, authorize prospecting for water resources, the establishment and maintenance of reservoirs, water-conservation works, power projects, transmission lines, and other facilities needed in the public interest, including the road construction and maintenance essential to development and use thereof, upon his determination that such use or uses in the specific area will better serve the interests of the United States and the people thereof than will its denial; and **(2)** the grazing of livestock, where established prior to September 3, 1964, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture.

(5) Other provisions of this Act to the contrary notwithstanding, the management of the Boundary Waters Canoe Area, formerly designated as the Superior, Little Indian Sioux, and Caribou Roadless Areas, in the Superior National Forest, Minnesota, shall be in accordance with regulations established by the Secretary of Agriculture in accordance with the general purpose of maintaining, without unnecessary restrictions on other uses, including that of timber, the primitive character of the area, particularly in the vicinity of lakes, streams, and portages: Provided, That nothing in this Act shall preclude the continuance within the area of any already established use of motorboats.

(6) Commercial services may be performed within the wilderness areas designated by this Act to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas.

(7) Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.

(8) Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish in the national forests.

STATE AND PRIVATE LANDS WITHIN WILDERNESS AREAS

Section 5.(a) In any case where State -owned or privately owned land is completely surrounded by national forest lands within areas designated by this Act as wilderness, such State or private owner shall be given such rights as may be necessary to assure adequate access to such State -owned or privately owned land by such State or private owner and their successors in interest, or the State -owned land or privately owned land shall be exchanged for federally owned land in the same State of approximately equal value under authorities available to the Secretary of Agriculture:

Transfers, restriction. Provided, however, That the United States shall not transfer to a State or private owner any mineral interests unless the State or private owner relinquishes or causes to be relinquished to the United States the mineral interest in the surrounded land.

(b) In any case where valid mining claims or other valid occupancies are wholly within a designated national forest wilderness area, the Secretary of Agriculture shall, by reasonable regulations consistent with the preservation of the area as wilderness, permit ingress and egress to such surrounded areas by means which have been or are being customarily enjoyed with respect to other such areas similarly situated.

Acquisition. (c) Subject to the appropriation of funds by Congress, the Secretary of Agriculture is authorized to acquire privately owned land within the perimeter of any area designated by this Act as wilderness if **(1)** the owner concurs in such acquisition or **(2)** the acquisition is specifically authorized by Congress.

GIFTS, BEQUESTS, AND CONTRIBUTIONS

Section 6.(a) The Secretary of Agriculture may accept gifts or bequests of land within wilderness areas designated by this Act for preservation as wilderness. The Secretary of Agriculture may also accept gifts or bequests of land adjacent to wilderness areas designated by this Act for preservation as wilderness if he has given sixty days advance notice thereof to the President of the Senate and the Speaker of the House of Representatives. Land

accepted by the Secretary of Agriculture under this section shall be come part of the wilderness area involved. Regulations with regard to any such land may be in accordance with such agreements, consistent with the policy of this Act, as are made at the time of such gift, or such conditions, consistent with such policy, as may be included in, and accepted with, such bequest.

(b) Authorization to accept private contributions and gifts The Secretary of Agriculture or the Secretary of the Interior is authorized to accept private contributions and gifts to be used to further the purposes of this Act.

ANNUAL REPORTS

Section 7. At the opening of each session of Congress, the Secretaries of Agriculture and Interior shall jointly report to the President for transmission to Congress on the status of the wilderness system, including a list and descriptions of the areas in the system, regulations in effect, and other pertinent information, together with any recommendations they may care to make.

APPROVED SEPTEMBER 3, 1964.

Legislative History:

House Reports: No 1538 accompanying H.R. 9070 (Committee on Interior & Insular Affairs) and No. 1829 (Committee of Conference).

Senate report: No. 109 (Committee on Interior & Insular Affairs). Congressional Record: Vol. 109 (1963):

- April 4, 8, considered in Senate.
- April 9, considered and passed Senate.
- Vol. 110 (1964): July 28, considered in House.
- July 30, considered and passed House, amended, in lieu of H.R. 9070
- August 20, House and Senate agreed to conference report.

Appendix E – Guidance documents for completing a Minimum Requirements Analysis

This appendix includes the following two documents that can aid in making decisions on proposed actions in designated wilderness.

Minimum Requirements References in U.S. Fish and Wildlife Policy (Pg 85-86)

This document provides agency-specific definitions and guidance to completing a Minimum Requirements Analysis for proposed actions in designated wilderness. A PDF-version of this document can be found at http://www.wilderness.net/MRDG/documents/MRDG_FWS_wilderness_policy.pdf.

Minimum Requirements Decision Guide Workbook (Pg 87-92)

This workbook is one that all agencies can use to display and compare proposed alternative actions in wilderness and document decisions. An Excel-based fill-in form can be found at http://www.wilderness.net/MRDG/documents/MRDG_workbook.xlsx. This provides instructions on completing a Minimum Requirements Analysis.



Minimum Requirements References in U.S. Fish and Wildlife Policy

610 FW 1 General Overview of Wilderness Stewardship Policy

1.5 Definitions.

M. Minimum Requirement Analysis (MRA). A decision-making process, documented in writing, that we use to determine if proposed refuge management activities conducted in wilderness are necessary to administer the area as wilderness and to accomplish the purposes of the refuge, including Wilderness Act purposes. If the activities are necessary, the MRA also describes how to minimize resultant impacts.

N. Minimum Tool. The least intrusive tool, equipment, device, force, regulation, or practice determined to be necessary to achieve a refuge management activity objective in wilderness.

Administrative guidelines.

1.18 How does the Service determine if a proposed refuge management activity is the minimum requirement for administering the area as wilderness and necessary to accomplish the purposes of the refuge, including Wilderness Act purposes?

We conduct and document a minimum requirement analysis (MRA) for all proposed refuge management activities that involve a generally prohibited use (also see section 1.19). The MRA clarifies the need for and impacts of a proposed action. We authorize an activity only if we demonstrate that it is necessary to meet the minimum requirement for administering the area as wilderness and necessary to accomplish the purposes of the refuge, including Wilderness Act purposes.

A. We identify and analyze alternative ways to accomplish refuge purposes, including Wilderness Act purposes, in order to determine whether the proposed refuge management activity is necessary and to identify the techniques that will minimize impacts to the wilderness resource. At a minimum, we evaluate the impacts of:

- (1) An alternative where we take no management action,
- (2) An alternative allowing no generally prohibited uses, and
- (3) Alternative(s) to conduct the activities inside the wilderness and outside the wilderness.

B. We consider the full range of wilderness values and character when evaluating the alternatives. These values include the undeveloped and untrammelled natural condition of wilderness, cultural resources, outstanding opportunities for solitude, the potential for the public to have a primitive and unconfined type of recreational experience, and other components of wilderness character.

C. We consider the direct impacts of the proposed refuge management activity under each of the alternatives. We also consider the indirect impacts associated with the action and the cumulative impacts of the action when it is conducted in conjunction with other existing or planned uses or actions within or adjacent to and affecting the wilderness areas. Under the nondegradation principle, the conditions prevailing in an area at the time of wilderness designation establish a benchmark for assessing the significance of a proposed action's beneficial and adverse impacts on wilderness character.

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D. Our refuge management activities preserve wilderness character and only rarely involve generally prohibited uses. The alternative that has the least impact on the area's wilderness character, including intangible aspects of wilderness character, and accomplishes refuges purposes, including wilderness purposes, constitutes the minimum requirement. We do not use cost or convenience as a factor in determining the minimum requirement or minimum tool. We use primitive tools when possible.

1.19 When must the Refuge System conduct a minimum requirement analysis?

A. If the refuge has an approved WSP less than 15 years old and it includes a written MRA for each proposed refuge management activity, we may carry out those activities as described in the plan. The analysis in the WSP must include an estimate of how frequently each activity will take place and the intensity of the activity. If circumstances significantly change or we want to allow the same activity in a significantly different part of the wilderness, we must prepare another MRA.

B. For any refuge management activity not addressed in a current WSP (less than 15 years old), we must amend the WSP to include the activity or prepare an MRA once per year, even for recurring actions.

1.20 Who makes minimum requirement decisions?

Refuge managers may make minimum requirement decisions only if they have attended the Carhart Center's national wilderness stewardship course (see section 1.23D). If refuge managers have not attended this training, they must send the MRA to their refuge supervisor for approval. If the supervisor lacks the required training, the supervisor must request review and approval from an individual who has had this training and is equal to or higher than the refuge manager in the organizational hierarchy.

1.21 What is the relationship of the MRA to the requirements of NEPA?

Under NEPA, we must consider alternatives to, and the environmental effects of, our actions, incorporate environmental information, and use public participation. We will prepare MRAs in conjunction with the documentation of NEPA compliance (i.e., categorical exclusion, environmental assessment, finding of no significant impact, environmental impact statement, record of decision). (See 550 FW 3 for more information about NEPA.). We will use information gathered for the MRA to document the purpose and need for a proposed project and to develop and describe the proposed action and alternatives.

1.22 What effects do emergencies involving the health and safety of people have on the uses generally prohibited by the Wilderness Act?

In an emergency involving the health and safety of people, we may use or authorize the use of motorized vehicles and equipment, mechanical transport, or aircraft. An MRA is not required, but we will take all reasonable measures to minimize impacts on the wilderness character.

March 2006



ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE WORKBOOK

"...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

-- The Wilderness Act of 1964

Project Title:

MRDG STEP 1

Determine if Administrative Action is Necessary

Description of the Situation

What is the situation that may prompt administrative action?

Options Outside of Wilderness

Can action be taken outside of wilderness that adequately addresses the situation?

☐ YES

☐ NO

Explain:

Criteria for Determining Necessity

Is action necessary to meet any of the criteria below?

A. Valid Existing Rights or Special Provisions of Wilderness Legislation

*Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that **requires** action? Cite law and section.*

☐ YES

☐ NO

Explain:

B. Requirements of Other Legislation

Is action necessary to meet the requirements of other federal laws? Cite law and section.

☐ YES☐ NO

Explain:

C. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: Untrammeled, Undeveloped, Natural, Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation, or Unique Attributes or Other Features?

UNTRAMMELED

☐ YES☐ NO

Explain:

UNDEVELOPED

☐ YES☐ NO

Explain:

NATURAL

☐ YES☐ NO

Explain:

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

☐ YES

☐ NO

Explain:

OTHER FEATURES OF VALUE

☐ YES

☐ NO

Explain:

Step 1 Decision

Is administrative action necessary in wilderness?

Decision Criteria

- A. Existing Rights or Special Provisions
- B. Requirements of Other Legislation
- C. Wilderness Character
 - Untrammeled
 - Undeveloped
 - Natural
 - Outstanding Opportunities
 - Other Features of Value

Summary Responses

Action IS NOT necessary to meet this criterion.

Action IS NOT necessary to meet this criterion.

Action IS NOT necessary to meet this criterion.

Action IS NOT necessary to meet this criterion.

Action IS NOT necessary to meet this criterion.

Action IS NOT necessary to meet this criterion.

Action IS NOT necessary to meet this criterion.

Is administrative action necessary in wilderness?

☐ YES

☐ NO

Explain:

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